# Engineering News-Record

*A Consolidation of Engineering News and Engineering Record*
McGRAW-HILL PUBLISHING COMPANY, Inc.
**December 27, 1917**

## Slow-Burning Timber Mill Construction—What Is It?

**It is not merely using large timbers with plank floors on widely separated beams. It is a well-developed system of construction with definite details built up through long and successful use. One of its leading exponents, F. W. Dean, Mill Architect and Engineer, Boston, tells in this issue what these details are.**

U.S. Malleable Iron Co.
Toledo O.
Westinghouse Airbrake
Wilmerding Pa.
Philadelphia Textile
Machine Co.
Continental Motors
Detroit
A FEW
Kreolite
Wood Block Floors
"They Outlast the Factory"
Increase Production,
Reduce Expense
No Maintenance Charge
Improve With Age
The Jennison-Wright Company
2479 Broadway, Toledo, Ohio
Branch Offices: New York, Philadelphia, Cleveland, Cincinnati, Chicago, St. Louis, Toronto, Pittsburgh
Vulcan Iron Works
Wilkesbarre
Mather Spring Co.
Willys-Overland
Defiance Machine Co.
Boiler Shop
Machine Shop

A Consolidation of Engineering News and Engineering Record. Published by McGraw-Hill Publishing Company, Inc.

# ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Volume 79 NEW YORK, THURSDAY, DECEMBER 27, 1917 Number 26

## A Clear Note on Society Service

ON page 1206 of this issue will be found an extract from an address by Fraser S. Keith, secretary of the Canadian Society of Civil Engineers. We have not read anywhere so clear an expression of the ideal of society service as is contained in the first paragraph of his address. The development of his ideas, too, shows a very clear vision of a society program, one that will cleave close to the membership and ensure their constant and enthusiastic support. It will be noted that he places service to the individual members on a high plane, by showing how such service is a necessary precedent to recognition by the public "of the engineer's real place in national affairs," which includes, Mr. Keith adds, "status, remuneration and opportunity of service." But Mr. Keith's address is interesting not only because of its intrinsic merit, but because it shows that the trend in professional thought in Canada is in the same direction as that here. In other words there is not merely a national unity of thought on either side of the boundary line. There is an international unity—which gives still greater validity to the society currents that are setting in both here and in Canada.

## Work To Be Done on River Transportation

THE government's farseeing decision of last Spring to stimulate waterway transportation has produced disappointingly small results. In this issue is given a brief account, based on official information, of what has been done on the Mississippi, our greatest potential waterway. The sum total is nothing more than promises for 1918, and even these must fail unless the Shipping Board redeems the government's semi-official promises that barges will be furnished. The great purpose of relieving the overstrain on the railways by utilizing the rivers has so far failed of accomplishment. If more tangible results are to be obtained next season, enthusiasm and the utmost resolve must be brought to bear on the subject by all the river interests in a united spirit. Nothing is harder to change than established traffic routes, but the change must surely be made. Packet and barge routes must be organized, public terminals must be provided, and traffic must be forced rather than solicited to seek the river. The casehardened skepticism of the local business people toward river transportation—based on long-time causes—can be transformed into energetic coöperation if the government will but speak in convincing earnestness. Only a few short months are left for preparation.

## Conference of Transportation Agencies

IT IS reported from Washington that a meeting will shortly be called for interchange of ideas as to methods of correlating the four chief transportation agencies —the railroads, the electric lines, the highways and the waterways. Commendation of such a proposal would, in the present situation, be gratuitous. The need stands out so strongly that one wonders how such a conference can be avoided and efficiency nevertheless secured. The real difficulty lies in breaking down the barriers to constructive thinking which competition has erected between the various agencies. Such a meeting as is proposed would materially help in breaking down the barriers. One prominent railroad man, devoting his energies to the government at Washington, has recently admitted that not until the present crises was he able to see clearly the possibilities of coördination between the railways and the highways. He had looked on the highway as a competitor. Others, without doubt, also emerging from their previous prejudices, need the help which a conference of the four agencies could give.

## Is This Where the Cars Are Going?

ONE hears in Washington on the authority of men thoroughly conversant with the industry, that it will not be possible to transport across the Atlantic, by the time they are delivered, one-half of the motor trucks for which the U. S. Government has already contracted. One hears, on equally good authority, that supplies of the most vital character—those which must be in France before this country can hope to place an army on the Western front, or feed it, or supply it with arms and munitions—are held in staggering quantities along the Atlantic seaboard awaiting shipment. It is freely admitted by official and unofficial Washington that the shipping situation is the key to the present emergency. Granted these conditions, is it possible that, through lack of coördination or appreciation of the ocean transport situation, each branch and department of the Government has gone ahead buying and shipping to the seaboard the goods and munitions which it finds necessary; and that the fact that present water transport facilities cannot begin to take this flow of materials away has more than a little to do with the lack of cars and the failure of our railroads to move such essential commodities as coal? When private interests were dumping commodities at the ports of the Atlantic seaboard faster than they could be removed, the railroads were able to protect themselves by declaring embargoes. Should there be a condition in which de-

partments of the U. S. Government were doing the same thing, and each department at the same time insisting that its freight was more important than anyone else's, the railroads would be defenseless. While Congress is investigating the railroad situation, inquiry in this direction might be productive of inestimable benefit. Should it develop that the Government departments might be better informed of ocean shipping conditions and better served thereby, or that better coördination in the time of delivery for supplies required by different departments might be secured, great improvement in the domestic railroad situation might be brought about.

## A Great Step Toward Professional Solidarity

THE election of Alfred D. Flinn to the secretaryships of the Engineering Council, the Engineering Foundation and the United Engineering Society, announced in this issue, is the first great fruit of the removal of the American Society of Civil Engineers to the Engineering Societies Building. It is evidence of the determination of the four great organizations to work as one when their problems meet. On technical matters their functions will be as distinct as before. But where engineering and engineers touch the public weal or when a question concerns the whole body of the profession the distinction between the societies are to disappear. The joining of the secretaryships, therefore, important as it is for what is actually accomplished, is even more important because of its significance as a forward step toward coöperation of all engineers.

If any doubt remained as to the advisability of the civil engineers joining with the other societies in the common home, the uniting of the secretaryships in one man effectively dispels it. It bears out the prediction freely made by *Engineering News* and *Engineering Record* when the removal project was under discussion that housing under one roof would inevitably bring the societies into very close spiritual union and lead to effective coöperation.

One cannot help enthusing over the prospects that this step opens up. One feels that we are measurably close to that long-sought-for professional solidarity. Heretofore it has seemed far distant. Hope appeared when the civil engineers voted to go to Thirty-ninth Street. Now there has been such a step that even the most skeptical must admit progress, must know that the desired day cannot be long delayed. All the more hopeful is the outlook since the Engineering Council has voted to amend its rules so that other societies than the four founders may be represented thereon. The amendment is now before the governing bodies of the founder societies for consideration.

Mr. Flinn has indeed a rare opportunity. But the position will not be an easy one. Responsibility and opportunity are commensurate. At present the council is unwieldy. It has not won from the societies that freedom of action which is necessary if it is to be responsive to the profession at large; and it must be responsive if it is to have the support and enthusiasm of engineers generally. Such support and enthusiasm are a *sine qua non* of success.

Mr. Flinn comes well prepared for the tasks ahead. He deserves the full confidence of the profession and the hearty support of its members.

## Steel Ships Are Being Built

THE resignation of Admiral Harris as general manager of the Emergency Fleet Corporation marks the final submergence of that body in the Shipping Board. Such submergence was a legal fact from the very start, for the corporation is but a creature of the board, formed to build ships under the less restrictive administration of a private corporation. But the public was led by the President's appointment of General Goethals to the managership of the corporation to consider that position of more importance than the chairmanship of the board. This public magnification of the place of the corporation was only increased when the President, not once more but twice, repeated the appointment of a general manager over the heads of the board, which successively showed its legal power by reducing that manager to a routine executive of the board's desires. Not until the third manager had resigned rather than accept an anomalous position was the board permitted to select its own manager. This journal considers that the building of ships—under appropriations now reaching a billion dollars—is not fit business for a government board, particularly when that board is amply busy with such activities as the chartering, licensing and manning of merchant vessels, the recruiting and training of men and the numerous judicial duties of a peace time organization. It would prefer to see the building program centered in one man, free of the Shipping Board. But lacking that the present development with a strong man like Mr. Hurley in command is the next best thing. Very evidently the chairman of the board is in the saddle, with a power and a disposition to take full responsibility for the shipbuilding progress of the next year and a half. This being a fact, this journal does not share some of the current pessimism regarding the building of ships. In spite of the friction between board and corporation, ships have been speeded up since July, at least. Of the other functions of the Shipping Board, the facts are not so clear nor the outlook so bright, but steel ships of large tonnage—the main necessity of the present time—are being built and will continue to be built at a speed far beyond the expectations of peaceful times and almost equal to that so easily demanded by the casual and ignorant critics of press and Congress.

## Safe Building with Timber

DETAIL drawings are sometimes strikingly inferior to descriptive words in defining the essentials of a construction method. That is why Mr. Dean makes virtually a pioneer contribution to the literature of building by his article in this issue expounding the defining characteristics of timber "mill construction." This valuable building type—its brilliant success in the New England textile mills entitles it to highest appreciation—has unfortunately remained a localism, little known outside of the Down-East provinces; and mainly because too often drawings have been depended upon to set forth a method that in reality is the expression of an attitude of mind.

A clearly outlined word-picture is now presented of just what the method is, the objects which the designer must accomplish and various means by which he may

do so. The full definition, it is true, is scattered in separate phrases through the article, but to the structural engineers they nevertheless stand out distinctly enough to coalesce into an integral statement. "The smallest practicable number of heavy beams covered with heavy smooth plank in turn covered with a top floor"; "reached by the smallest number of automatic sprinklers"; "entire absence of concealed spaces"; "the beams continuous ties to the sides of the building"; "metal deeply buried within the wood";—these are some of the elements of Mr. Dean's definition.

It is profitable to consider further a few of the points involved. Rigidity, which the article dwells on, has an intimate relation to strength, and the great strength provided in "mill construction" is a prime factor in securing rigidity. The plank-and-beam floors possess a carrying capacity of well over 500 lb. per square foot distributed loading, which is far in excess of ordinary manufacturing-floor needs. This solidity of construction has unquestionably helped to establish the type; and when we reflect on what is common practice in other forms of building, paring the loadings down to a minimum and designing to bear this minimum without excess, it is easy to see in the generous provision of strength something to be emulated.

Sprinklers find mention in Mr. Dean's exposition. Doubtless they are to be considered a vital characteristic of the type of construction. Without sprinklers and firewall subdivision probably no such history of success would have been recorded as "mill construction" actually can show.

Great structural strength, minimum opportunity for attack by fire, means for extinguishing or checking a fire starting in the contents, an arrangement that will confine a fire to a small section, rigidity, and stability not only when completed but also when partly fire-wrecked—these elements secured by the use of timber framing in a quickly-erected, economical form are comprehended in "mill construction." The type is worth far more attention than it has received in the recent past. We have neglected timber construction unduly and invested many a dollar in buildings of more costly type that can show no record of superior strength, permanence, or fire-resistance. In the days to come of more urgently imperative economy, "mill construction" and other ways of utilizing timber will again claim close attention.

## Uncoördinated State Engineering Sets a Problem

WHILE every engineering organization in the land is straining for increased efficiency to meet the demands of the times, state engineering work continues in the formless, haphazard condition that has characterized it for years past. The inefficient scattering of engineering work among many separate state bureaus has long been in need of reform. But today the mobilization of the country's engineering resources calls for immediate action to change this condition—by emergency methods, if needful.

A well-known engineer who is in close daily touch with the technical bureaus of one of our richest states makes a significant remark about them. He says that not only are the several engineering offices totally uninformed about each other's problems and working methods but even the men are strangers; the engineers of one bureau are not acquainted with those of other bureaus. This remark, however surprising, will be found equally applicable to many other states.

A dozen or more large engineering departments represent the sovereign authority of a great commonwealth in relation to a multitude of public-welfare questions; and these numerous bodies act just as if each one existed alone, as if their work had no interrelation or points of mutual contact.

No need to ask whether real efficiency is secured when such a condition exists. The state is in precisely the same position as any private corporation in regard to the necessity for centralized administration. It cannot secure reasonable over-all efficiency in its engineering work when this is split up among many autonomous offices. Waste, duplication of effort, imperfect utilization of experience, are inevitable consequences.

The existing state of affairs is not to be blamed on engineers. It came about through no fault of theirs, during the rapid growth of state engineering within the past ten or fifteen years, when legislatures created department after department to care for new needs; looking at the subject from the administrative side only, the lawmakers disregarded the essential engineering unity of the work involved. Engineers on the contrary have done their part to achieve a good result even under the conditions thus forced upon them. They have labored in their several departments efficiently and conscientiously. But this could not make headway against the inherent lack of coördination.

While engineers, therefore, are not responsible for low efficiency and lack of system in state engineering, yet the burden of the present obligation to reform lies mainly upon them. They alone are able to perceive the present compulsion toward immediate coördination, and therefore, from them must come the initiative.

The problems of next year's work are already presenting themselves. They demand coördination as a prerequisite to their solution. The selection of urgent construction and the elimination of the non-urgent; the allotment of money and labor to either maintenance or construction, whichever shall be found to be more productive; the adjustment of administrative and regulatory activities to the special needs of the times—such questions must be subjected to fullest study. Engineering analysis is required, and all the experience and knowledge of the state's departments must be joined in the study.

The situation calls for early coördination of the engineering departments, or at least of their engineering thought, within the government of each state. If it can be secured quickly enough through legislative or executive action, official coördination gives the best promise of success. Failing this, however, the engineers themselves can bring about a result sufficient for the moment's needs.

Let representatives of separate departments come together of their own motion, unofficially, and as a technical association discuss the state's technical problems. If their study is thorough, and their conclusions clear and courageous, they are sure to have the people's support.

# What Is Mill Building Construction?

## An Exposition of the Essentials Governing This Type of Fire-Resisting Building and of the Details That Distinguish It

By F. W. Dean
Mill Architect and Engineer, Boston

SLOW-BURNING mill construction is the name applied to a long-used type of fire-resisting timber building common in New England, especially in textile mills. The name represents a very definite idea in design and construction, and one well understood by those accustomed to building this type of structure. It seems to the writer, however, that many architects and engineers are not sufficiently familiar with the fundamental requirements of mill construction and are apt to consider it merely the use of plank floors resting on widely separated beams. In fact, the technical press has of late published designs of so-called mill construction which not only violate the rules of that construction but which may cause the very trouble it is intended to avert. It seems desirable, therefore, to state as briefly as possible how a mill construction building should be designed, giving the reasons, with illustrations, for the methods described.

In the design of factory buildings, certain principles should be clearly kept in view. In a general way, it can be stated that these are minimum opportunity for the occurrence, travel and wrecking effect of fires—with a resultant low cost of insurance—rigidity, and great admission of light. These conditions are realized to the maximum by two types of construction, the older being mill construction, and the newer reinforced concrete. As fire risks, both are considered by the mutual insurance companies as first-class, and their relative values as such in the estimation of these companies is shown by the net rates which they make, which are about 5.5c. per $100 for mill construction and 4.8c. for reinforced concrete.

### New England Leads in Mill Construction

Regular mill construction originated in New England and is, or has been, carried out to the greatest perfection in that part of the country, and chiefly in textile mills. As now designed by the best mill engineers, it consists of brick walls, with heavy transverse wood beams, on top of which, for floors, are spiked thick planks at right angles to the beams, and these planks are covered with a top floor at right angles to the planks. The planks are grooved on both edges and so-called wood splines are tightly driven into the grooves of adjoining planks so that one plank will assist in the support of the next, thus stiffening the floor for isolated loads and preventing one plank from moving vertically relatively to the next (Fig. 1). The spaces between the beams or the "bays" should not be so wide as to require beams at right angles to the main beams, or any subdivision of the bays. A maximum bay width of 10 ft., except to accomplish a special object, is advisable. Wherever any metal is used it should always be deeply buried within the wood so that fire cannot reach it at first.

From the above it will be seen that real mill construction contemplates the smallest practicable number of heavy smooth beams covered with heavy smooth plank in turn covered with a top floor. The mass of such construction, the small amount of surface and the smoothness of the surfaces are fire resisting, and merit the name which is often applied to it, of being "slow-burning." Compared with this, the floor and roof construction consisting of planks on edge for beams and a foot or two apart are kindling wood. Mill construction also contemplates the entire absence of concealed spaces and the use of such spaces as can readily be reached by the spray from the smallest number of automatic sprinklers. It will readily be seen that the spaces between the beams of mill construction can be reached by a few sprinklers, while with the older construction many times as many sprinkler pipes and heads are required to give protection, as every part must be reached by the spray.

The beams of mill construction afford opportunity for supporting shaft hangers, and the spaces between them give room for pulleys and belts. If short countershafts are to be put up the wide flat surfaces between the beams afford an opportunity for attaching them.

### Pintles Over Columns Are Fundamental to Type

Reference has been made to rigidity. The method of fastening the beams to each other where they butt together, and to the walls, is of great importance in securing this end. This must be considered in connection with the columns, and it is with respect to these and connecting the beams together that architects unversed in this type invariably fail. It is well understood that columns should rest end to end upon each other from top to bottom of buildings, but the columns themselves should not pass through the floors and between the ends of the beams, as is often done. Proceeding upward they should stop at the bottoms of the beams, and begin again at the tops. Between the top of one column and the bottom of the one above it there should be a short separate cast-iron column known as a "pintle" (Fig. 1). Being of cast iron, which is a material of great compressive resistance, it may be very small in diameter, and requires only a small hole through the beam to accommodate it, half of the hole being in the end of one beam and half in the other. The lower end of the pintle rests on the cap of the lower column and the top of the pintle receives the lower end of the column above.

There are several advantages in this construction. In consequence of it, the beams actually butt against each other, and having only a small hole through them (not much over 4 in. in diameter) the ends of the beams are actually over the body of the column and are not supported by the overhanging ends of the column cap.

If a cap end is burnt off or breaks off the beam is held as securely as ever. It is a common thing for architects to carry the lower end of a column to the top of the one below, and sometimes both columns are of the same size. The result is that the beams are supported by the overhanging ends of the column caps. This is dangerous construction, in respect to both strength and fire resistance. The end may break if of cast iron, bend if of steel, become soft in a fire and cause the floor to fall. In this construction most of the cap, and the whole of the part which supports the beam, are exposed to the fire.

The pintle construction, as before stated, permits the beams to butt against each other and thus become perfect struts to transmit pressure from one side of the building to the other, and it also gives room to put two iron dogs, or ties in the tops of the beams, one on each side of the pintle, to tie the beams together. Thus the beams become not only struts but rigid and continuous ties to keep the sides of the building in their proper relative positions. At the same time the pintles and dogs fulfill the necessary conditions before mentioned of being surrounded by heavy wood, for the pintles are within the beams and the dogs are embedded in grooves in the tops of the beams and covered by the floor planks. Moreover, the dogs cannot work out because they are beneath the planks (Fig. 1).

Where the pintles enlarge at the top to take the upper column only the top edges should be exposed to fire and can scarcely be injured. It should not be overlooked that when the beams and planks shrink the pintle tops become more exposed than at first, and allowance should be made for this. It should be observed also that the enlarged hole for the top of the pintle is in the plank and not in the beam (Fig. 2).

Still another advantage of pintle construction is that if a floor falls and a column below is knocked over by the falling floor or a heavy piece of machinery, it simply tips over on top of the pintle. A column which goes down between the beams if knocked over would pry the beams apart, punch a hole through the wall, possibly push it over, and cause the beam to drop off the column and fall. Thus the building might be wrecked on account of the absence of pintle construction.

### Rigidity of Connection Is Necessary

The beams must be connected to the wall in such a way that the walls will not be pushed or pulled until after this connection is made, such effort only coming from wind pressure or manufacturing strain. The beam ends should rest in cast-iron boxes with side wings firmly built into the walls (Fig. 2). The beams should then be made to butt firmly over the columns and be drawn together by driving in the dogs which for this purpose have their ends inclined where entering the wood. When this is done one or two lag screws should be screwed into the beams through holes in projecting lips of the beam boxes, which completes the connection across the building. After this is done the lips of the column caps are lag-screwed to the beams, thus making

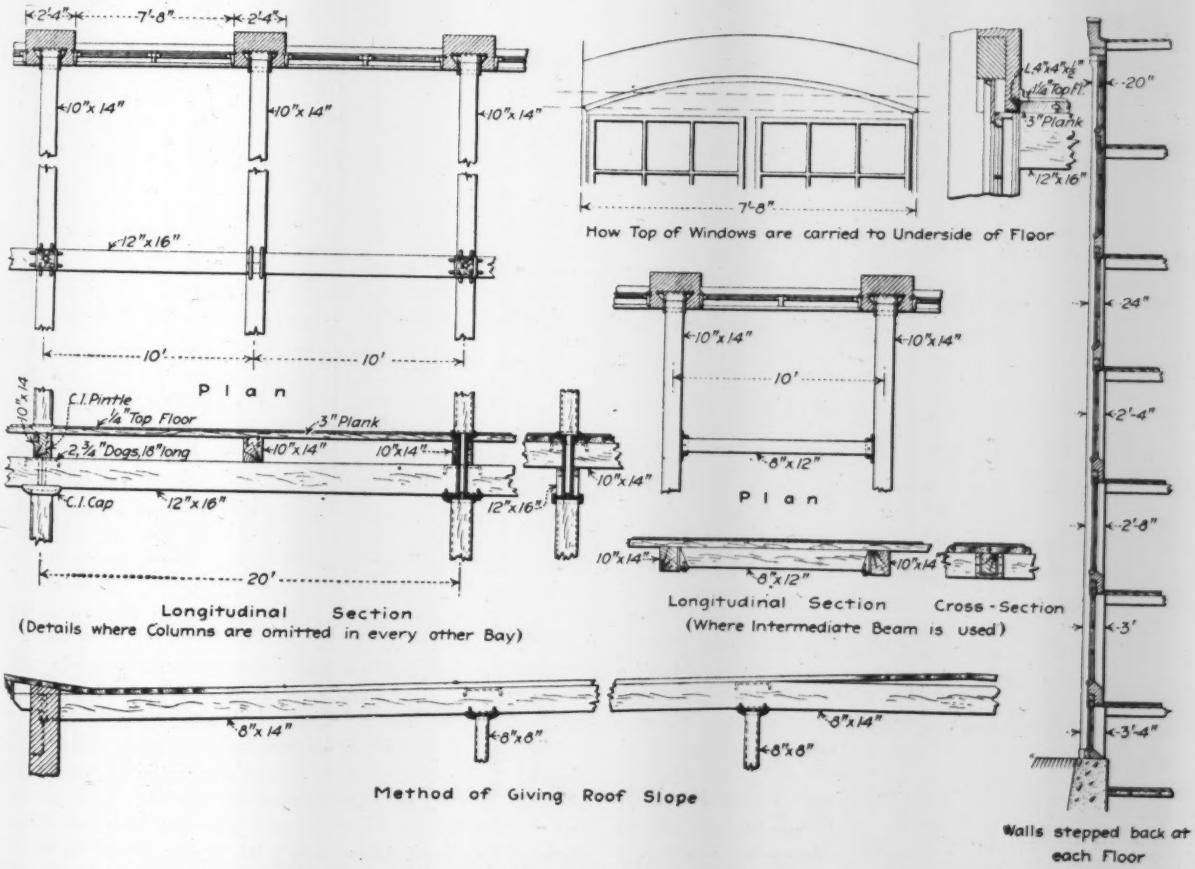



FIG. 1. WALL, COLUMN AND FLOOR DETAILS OF TYPICAL MILL CONSTRUCTION

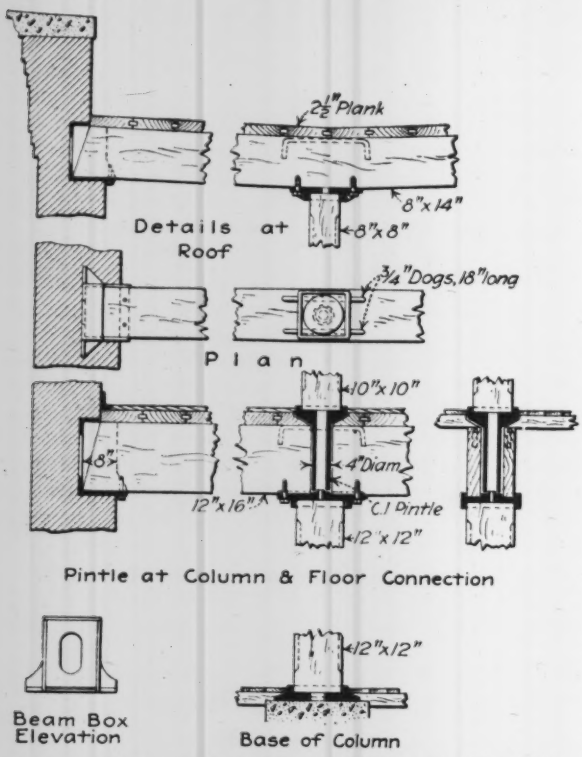



FIG. 2. SOME SPECIAL DETAILS USED IN FRAMING MILL CONSTRUCTION

the columns stable and preventing the beams from pressing against the pintles. Thus the column caps as well as the dogs hold the beams firmly together. No attempt should be made to have the pintle fit the hole, as it should be free to maintain its position as the beams are moved slightly when the dogs are driven. In fact the hole for the pintle should be at least ½ in. larger in diameter than the pintle (Fig. 2).

Beams usually end over columns, but if they do not, a hole is bored through for the pintle, and dogs are not required.

Floor-beams when double should have no space between them as was formerly provided in order to permit air to circulate between, as these spaces hold fire tenaciously.

There is a very pernicious practice of supporting intermediate cross-beams so that their upper surfaces are level with those of the beams which they join. This is effected by the use of forged stirrups or commercial beam-hangers. When a fire occurs they are easily softened and give way if they support any material weight, which they often do. Beams should never be supported in this way if it is possible to avoid such construction, and if they are, heavy cast-iron beam-sockets should be used lag-screwed to the beams Fig. 2). The commercial beam-hanger is a great menace to the safety of buildings.

Roofs are framed, supported and planked after the manner of floors, using dogs, and the latter should be driven before the brickwork is built around the anchors in the walls (Fig. 2). When there is not a row of columns in the center of the room, the roof beams should not be carried on the slant to the center of the building and there fastened together, with the expectation that a stable roof will result. Horizontal beams should run between the two rows of columns next to the center and the roof slant given by wedge-shaped pieces spiked to the beams (Fig. 1). Roof beams are not usually secured to the walls by means of beam-boxes, but they might be advantageously employed, especially if parapet walls are used. Wrought-iron anchors spiked or screwed to the beams are generally used (Fig. 1).

### Special Beam Arrangements Possible

Sometimes it is desired to have columns omitted in every other bay, and the beams that do not rest on columns must be supported by longitudinal stringers resting on top of the columns that are used. Many architects in this case yield to the temptation to use the beam-hangers disapproved of above, but instead of this the stringers should be lower than the transverse beams by the depth of the latter, and the intermediate transverse beams should rest on top of them, and be fastened thereto (Fig. 1). Thus slow-burning construction is fully realized in this detail. The stringers are separated from the floor by the depth of the transverse beams, and the space thus provided is very convenient for the upper strands of belting. In this construction vertical shrinkage of the beams is considerable, and the pintles, which are long enough to go through both longitudinal and transverse beams, should be rather short, so that after the shrinkage the top will not appear materially above the floor.

Floor planks are usually 2½ in. to 5 in. thick and in widths not exceeding 10 in. They should be at least two bays long, but there must be enough one-bay lengths to cause breaking of joints. It is not necessary to have every other plank break joints; four or five planks of the same length can be laid side by side and the next set can break joints with these. Where floor planks are interrupted by pintles they should be fitted under the pintle to some extent, so that their ends will rest on the beams. This with the splines and top floors will support them. Otherwise they should rest on a stick secured to the adjoining planks by lag screws.

### Beams Wrongly Placed

It is inadvisable to have beams at right angles to the main transverse beams in a factory—that is, parallel to the sides of the mill. One objection to this is, that if they are not at or near the center of the building they cut off the top light. Some architects wrongly place such beams against the sides of the building above the windows, and thereby prevent the tops of the windows from being as high as they might be, and close to the underside of the floor. These beams are hung to the transverse beams by means of the objectionable hangers already commented upon, and even intermediate transverse beams are sometimes hung to them. If the bays are not too wide intermediate beams are unnecessary, but architects often make the bays so wide that they are compelled to use intermediate beams, and this causes them to run the planks the wrong way.

The tops of the windows can be brought to the underside of the floor by building the arch in the next story above. The opening which would thus be made above the upper floor is closed by not carrying the arch clear through the wall. One course of brick carried down to the springing of the arch is sufficient to close the open-

ing, and this is supported by an angle iron spanning the window opening (Fig. 1). If a straight arch is used this is supported by angles or other forms of structural material.

The beams are usually made of long-leaf Southern pine, which formerly came chiefly from Georgia, but the name "Georgia pine" is now chiefly a name, as such pine comes from any state south of North Carolina, and even from Cuba. In Canada, British Columbia fir is largely used and since the Panama Canal was opened this kind of wood from Washington and Oregon has come East in considerable quantities. It can be obtained of any desired dimensions and although not quite so strong as Southern pine is a better wood in other respects. It is clearer, freer from sap, more uniform throughout its texture, and less likely to crack, than Southern pine. On account of its good qualities, it is, practically speaking, as strong as Southern pine. Beams should be chamfered on the lower edges between bearings, for the sake of appearance, and, some persons have stated, to do away with corners which readily ignite.

### Floor Details Are of Fixed Type

Floor planks are made of spruce or pine, planed on three sides, grooved for splines, and for appearance slightly beveled or beaded on the bottom edges. The splines are made of clear yellow pine and are always ⅜ in. x 1½ in. and, as already stated, should fit tight enough to require driving in. The planks should end on the centers of the beams, and be nailed on each beam with two nails of such lengths that two to three inches should penetrate the beams.

On each side of a room a plank should be left out until the building is well dried, as the planks sometimes swell enough to push out the walls.

On the planks there should be one or two layers of tarred paper, or, better, a paper covered with an elastic material which will fit around the nails securing the top floor, in order to make the floor waterproof. Such a

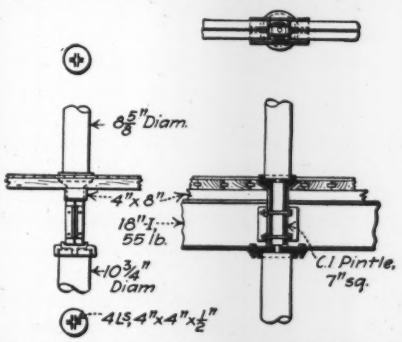



FIG. 3. PINTLE DESIGN FOR METAL COLUMNS

lining is intended to continue to be tight around nails after the floors shrink.

In Canada, and to some extent in this country, it is the practice to use for floors planks on edge nailed together horizontally. It is not customary to end these strips over the beams, but anywhere. This weakens the floor seriously and should not be permitted. Sometimes, if such floors are very thick, they are not fastened to the beams.

Top floors are usually of square-edged maple of ⅞ in. nominal thickness, but sometimes thicker. The boards are commonly 5 in. wide and should not be less than 6 ft. long. They should be kiln dried, wedged together when laid, nailed with two nails 16 in. apart on diagonal lines, with two nails at the end of each board independent of the diagonal nailing. Sometimes top floors are laid diagonally, but little or nothing is gained by this and the cost is a little more. All nails should be set and the floor planed if it is not smooth enough without it.

Steel beams are used somewhat in mill construction buildings, but are not liked by the insurance companies as well as wood. They tolerate them, however, trusting to sprinklers to keep them cool in case of fire, and consider that a fire will be confined to one story. Their advantages are that piers are not cut away by their use as in the case of wood and can therefore be narrower, thus increasing the window width, and columns can be farther apart. The beams should be laid on the walls as the work proceeds, with one brick course fitted around them in the face of the wall, and the pocket thus formed filled with cement grout. The brickwork can then proceed and the wall is not reduced in cross-section where the beam enters. If steel beams are used pintles should not be omitted, and beam boxes might be used.

### Anchoring of Steel Beams

The anchoring of steel beams in walls is not quite so desirably accomplished as with wood. The common way is to have a couple of short pieces of steel angle riveted vertically to the web near the end of the beam to anchor it, and build the beam in as described above. The beam can be drawn up to the pintle before this is done. If the beam falls in a fire it will pry out some of the brickwork. A beam-box could be used, as in the case of wood beams, and bolted to the lower flange of the beam before the box is built into the brickwork. The beam and box could then be slid as the beam is drawn up to the pintle.

Square or rectangular pintles look better with steel beams than round ones, as the beam ends fit against them better. Sometimes the lower flange is bolted to a bracket cast on the bottom of the pintle and sometimes the web is bolted to an appropriate projection on the pintle. The best way is to rivet angles to the web, and bolt the beams together by means of bolts passing through oblong holes cast in the pintle, as in Fig. 3. Care must be taken to have the beam rest over the top of the column and avoid transverse stress in the pintle brackets.

The remarks on floors will apply to roofs, except that spruce sometimes warps and turns up its edges so that it may injure the roof paper. The standard slope of mill roofs is ½ in. per foot.

Concerning roof coverings, there are many different makes, any of which will be furnished with a guaranty of five or ten years. Tar and gravel are very satisfactory and should be five or six ply thick. Thick roof coverings of this kind are important in some places on account of their heat insulating qualities, which assist in preventing condensation of humid atmosphere on the underside in cold weather.

The undersides of roofs and floors are sometimes painted white, but the cracks between the planks makes them look bad, although the lighting effect is good. Likewise, brick walls can be painted, but the natural

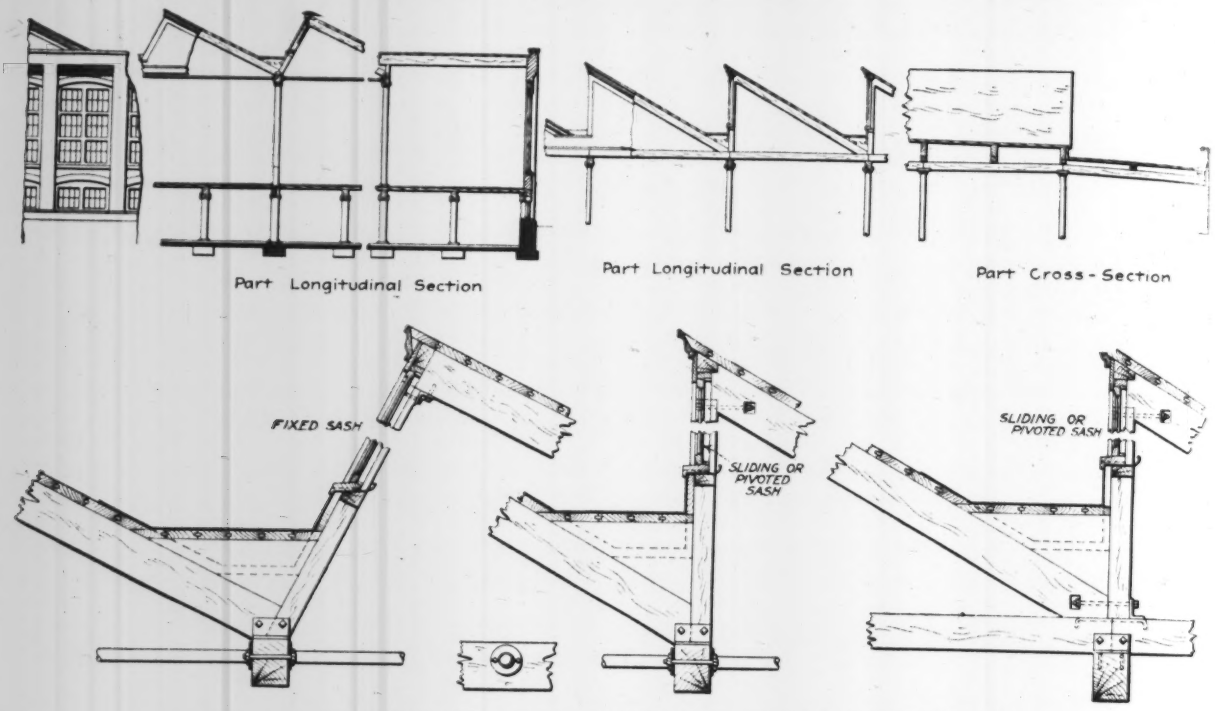



FIG. 4. HOW SAW-TOOTH ROOFS ARE DETAILED IN MILL CONSTRUCTION

brick looks better. Brick looks best when washed down with acid and oiled.

### Columns and Walls Have Some Variations

Columns are usually made of long-leaf Southern pine and should be carefully selected for straightness of grain and freedom from defects. It is very important that the ends should be square with the axis, and when the columns are round this is easily accomplished in the lathe. Wood columns are often made as small as 6 in. square, but they are very apt to spring and in hot factories this is true of columns of any size. Practically, it is better to have 8 in. the minimum size. Pipe columns filled with concrete are used, but the mutual insurance companies consider wood columns a better fire risk, and where the pipe concrete columns are used they prefer to have a reinforcement placed inside, this being strong enough to support the load. The stock companies do not require this. This type of column without interior reinforcement went through the Salem fire successfully. Even with these columns, or those of cast iron, pintles should be used. Both ends of pintles should be faced off square and likewise the surfaces with which they come in contact, and pintles for square columns should have a circular face on which the column rests so that it can be faced in a lathe or boring mill (Fig. 2).

Wood columns were formerly bored and ventilating holes made at top and bottom. The benefit of this cannot be ascertained and the practice has been generally abandoned.

The upper and lower ends of wood columns should be treated with a preservative, especially the lower ends, as they are frequently wet from washing the floors.

In building such a factory some designers have slanted the piers between windows inward on the outside of the building. This is expensive and useless, and it should be kept in mind that the center of pressure coming from the weights should be as near the center of the foundation as possible. By stepping the walls back 4 in. or more at each floor on the inside of the building, or at every other floor, this is partly accomplished and the outside of the pier can be kept vertical (Fig. 1). If the pier is inclined or made like a stepped buttress on the outside, the result is that the foundation will be eccentrically loaded. These inclined or buttressed pieces accomplish nothing desirable.

If a wood floor is desired in the basement the best way is to make a tar concrete and wood floor, as follows: The earth should be filled-in layers 6 in. thick and rammed level. On top of this there is to be a layer 3 in. thick of hot tar concrete laid and rolled firmly and level, the upper ½ in. being of fine material laid hot and well rolled to prevent moisture from coming through. On this there is to be a layer of unplaned square-edged plank 2½ in. to 4 in. thick, laid close. The plank should be kyanized or treated with other preservative to prevent decay. A top floor is then laid at right angles to the plank and well nailed. The plank need not be splined, because there is no chance for vertical movement.

It is not well to use sleepers, as it is difficult to surround them properly with tar concrete and difficult to get them level, and they accomplish nothing useful. A floor as above described is a heavy solid mass and is bound together by the top floor. Experience shows that it is satisfactory without being fastened to anything and is suitable for holding any machinery that does not require foundations. It is good where wet processes are carried on.

The top story of a factory is often surmounted by a monitor roof which adds to the light in that story,

but saw-sooth roofs give the best light. They should face the north, or as near it as the location of the factory will permit. If they face the north, the light on a cloudy day is about as good as on a bright day, and it is difficult in such rooms to tell whether the sun is shining or not. The details of saw-tooth roofs are something of a problem. One of the difficulties is devising proper draining of the valleys between the saw-teeth. If the buildings are narrow, the valleys may slope from the middle to the sides of the roof, but if they are wide there should be several such slopes, and drainage should be provided at several points. Sometimes the whole saw-tooth is highest in the middle of the roof and slopes toward each side, even in wide buildings. Such construction produces awkward looking roofs, and causes the windows in the faces to be stepped. The writer prefers to keep the ridge of the saw-tooth level and slope the valley planking from high points to low, which presents no difficulty. The roof beams can have different slopes, the high ends being on the same level and the lower ends at different levels, the planking forming a warped surface. However it is done, it is almost necessary to plank the valleys over to provide a wide flat space next to the window face, but care must be taken to avoid concealed spaces in this detail.

The horizontal beams below the saw-teeth, when used, and the beams between the ends of the saw-teeth and the sides of building, are usually supported from the main transvers beams by means of exposed metal hangers, such as have been elsewhere condemned, even in designs by the best mill architects. This construction, of course, should not be made, on account of its poor fire resistance.

### Faces of Sawtooth Roofs

Saw-tooth roofs are built with either inclined or vertical faces. The former are generally used, but vertical faces are easier to construct and permit the use of swinging or sliding sashes, while inclined faces must have glass reaching to the bottom of the windows, or water will stand on the horizontal mullions and finally leak through. Furthermore, condensation on the inner surface of inclined glass will drop on the floor and goods in process, while it will run to the bottom of vertical glass, where it can be caught. In either case, the flashing should run under the window stool and be formed into a drip pan, with ends stopped up, from which it can run out through grooves in the underside of the stool. Which form of saw-tooth should be used depends more upon the feelings of the designer than anything else. Inclined faces probably let in more light than the others, but it would require careful observation to detect any difference.

If shafting is to be overhead in a saw-tooth building wood stringers are used overhead for supports, and they serve to tie the saw-teeth together. If the shafting is located below the floor, the overhead stringers are omitted and tie rods are used. These rods sometimes run through pipes which serve as struts and obscure the sag of the rods, but the pipes only should be used, and if properly secured at the ends serve both as ties and struts.

In Fig. 4 is shown how the principles of slow-burning mill construction can be applied to saw-tooth roofs. To avoid metal beam-hangers the longitudinal beams rest on top of the transverse beams and may be secured to them as shown or by spikes or other means which may occur to the designer. He should have in mind that what metal he uses should be buried in wood if possible, and if not it should be above the beams.

Resting the saw-tooth beams on top of the main transverse beams, which secures maximum fire resistance, causes the valleys to be narrower than most designers like, but by planking over high enough, sufficient width can be obtained.

Persons interested in the quality of hard pine for mill construction are referred to a pamphlet issued by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies, 31 Milk St., Boston, Mass., entitled "Dry Rot in Factory Timbers," and to matter published by the Southern Pine Association, New Orleans, and the National Lumber Manufacturers' Association, Chicago, Illinois.

---

# Philippine City's Lowland Raised by Harbor Dredging

## Valuable River Front Property in Iloilo Developed by Selling Fill to Private Owners and by Creating Public Areas

By W. C. A. Palmer
Supervising Engineer, Western Visayas, Iloilo, P. I.

MAKING river-front fills from dredged material is no new thing, but as a rule it is either a casual disposal of earth which has to be removed in channel improvement or else it is a scheme for reclaiming land. In the city and harbor of Iloilo, P. I., there has been a combination of the two, with the added factor of the sale of the filling material to private owners who wished to raise their low ground.

The location of the city is such that a great deal of lowland lies adjacent to the Iloilo River, a tidal delta stream. Virtually, the entire city is delta land, built up by river and sea deposits. The Island of Guimaras lies about two kilometers, across Guimaras Straits, from the mouth of the Iloilo River. There is a range of tide of about two meters and the river is constantly silting up, both from the straits and from the upper reaches of the river. This has made it necessary to expend from $15,000 to $20,000 annually in keeping the river channel free for the uses of navigation.

The first dredging operations for the benefit of navigation in the river were made in 1906, about the time of the construction of the Philippine Railway Co.'s terminals at the mouth of the river. At this time two jetties of riprap and fascine wall were constructed by the J. G. White Co. and its suction dredge filled in all that part of Iloilo now occupied by the railway company's shops and administrative offices. In 1909-10, the Atlantic, Gulf and Pacific Co.'s dredge "Manila" was brought to Iloilo, and lowlands were filled from the spoil dredged out of the river. At this time the lowlands from the lower reach up to about the center of the town were filled, this land belonging in the main to large property owners. For several years after 1910 no fill was attempted. An elevator dredge from Manila was

sent down each year and spoil was loaded into scows alongside of the dredge, carried out into the bay and dumped. For the past few years, this work has been done by the Philippine Government's steamship "Dredger," a sea-going self-propelling suction dredge of the hopper type.

In the past it has been the custom to remove from the river about 250,000 to 300,000 cu.m. of deposit, carrying it out into the deep channel, and letting it go to waste. In 1916, the district engineer of Iloilo made an attempt to use the discharge apparatus of the steamship "Dredger" and filled certain of the lowlands abutting the Iloilo river, notably the Iloilo Custom House site, where a new $150,000 structure has just been completed. This work resulted so satisfactorily and caused so much favorable comment that when arrangements were made for the annual dredging of the river the property owners, as well as the provincial governor and health officials, requested that the Government follow the same procedure for general land filling in 1917. Therefore, by an act of the Philippine Legislature, an arrangement was made whereby property owners could contract with the proper authorities for the delivery of such spoil as was incident to the harbor improvements, the same to be delivered upon their lands at the actual cost of such delivery. These contracts are made to cover a period of five years, payment to be made in five equal instalments and the first instalment falling due one year from the date of execution of the contract.

Meanwhile, suction dredge No. 3, a modern 15-in. dredge, having a capacity of about 2000 cu.m. daily, was sent to Iloilo to clean out the river. Inasmuch as experience has taught that the river silts from the reaches above the town and from the bay both, it was decided that by dredging the upper reaches of the river in such a way as to create an eddy much of the silt would be deposited before coming into those areas ordinarily filled with silt.

The lower reaches of the river fill up from the action of the monsoons and a strong 8-mile current that flows both ways, forming an eddy in the mouth of the river. The jetties built only partially keep the river clear, so it is always necessary to dredge the bar annually.

The first land to be filled was the site of the new public market, an area of 10,000 sq.m. (about two and one-half acres) filled to an average depth of slightly over one meter. To reach this location, it was necessary to pump through a pipe line over 450 m. in length. Work was slow, owing to the fact that the dredge had received severe buffeting on its voyage to Iloilo, and from time to time repairs were necessary. However, the fill was so good that construction work on the La Paz market was started. This fill was a pure sand, mixed with gravel, there being very little mud. Indeed, the fill was so hard that it was possible to drive around the end of the discharge pipe in an automobile even when the material was being pumped in.

RETAINING WALL OF SAND AND MUD-FILLED GRASS SACKS HOLDS DREDGED FILL

DELIVERING HYDRAULIC FILL AROUND RIVERSIDE HUTS IN ILOILO, P. I.

It has been found possible to build dikes with the dredge where the material is hard sand or sand mixed with gravel and carrying a small proportion of mud. The pipe is carried on shear legs along the line where a dike is to be built, and the joints of the pipe are opened sufficiently to allow the material to fall through as it passes the joints. In this way, it has been possible in the beginning to run up a pipe line along the outside of a lot, build a dike to the required height and to retain all of the lighter material and mud which comes later, and which, without an exceptionally good dike, floats away and is lost. Inasmuch as this light material is a considerable percentage of the whole, it is well worth saving.

Those owners who abut upon the river were obliged to build a riprap wall which, when covered with "sawali" (woven bamboo mats), proved to be an excellent type of retaining wall. These pieces of property which have been filled by the dredge have come, from worthless property, to be about the most valuable land in the City of Iloilo, being river frontage available for wharfage.

It is also close to the new market and railroad station, and is valuable both for warehouse and store property. In addition, this district, from being a low, unsanitary spot which was a constant menace to the health of the community and a breeding place for mosquitoes, has been changed into a high, pleasant and very sanitary section of town.

The cost to date of this work has been high, even higher than anticipated, owing to the fact that it was about a month before the dredge was working properly; also, due to the high cost of fuel, coal being $18 per ton. Coal at this price cost at the rate of $140 per day. An economy was found possible in the use of wood "rajas," selling from $16 to $23 per thousand according to size, and costing from $68 to $90 per day. It is necessary to use some coal, however, so fuel amounts to about $75 to $80 daily on an average. Other economies have resulted in a marked decrease in the use of oil and babbitt metal, so the dredge daily costs less to run and increases in efficiency.

About 45,000 cu.m. of fill have been handled at a gross cost of approximately $10,000, or an average of 22c. per cu.m. of fill in place. This is the total cost, and includes the expense of bringing the dredge from Manila, a sea voyage of 365 miles, and rather expensive repairs which were made in the beginning and which must necessarily be prorated to the whole project. Also much of this cost is directly chargeable to maintenance, so that the final cost of this fill to the property owners should be approximately 15c. per cubic meter.

The more fill made the lower the resulting cost to the property owners, and, as a consequence, the officials were very desirous of doing as much of this work as possible. Applications for fill have increased beyond the possibility of handling, and the excessive cost of pipe line, under the present freight condition, is such that it is prohibitive to buy more pipe, costing as it does $7.50 per foot. This necessarily limits the distance to which fill can be delivered. The response in Iloilo has been very gratifying indeed, and the dredge will be worked as long as conditions will permit.

# Building Frame Houses for Miners As a Contract Job

## Several Hundred Just Completed for West Virginia Company—Model Single House Designed — Field Methods Used

By C. S. Rindsfoos
Jarrett-Chambers Co., Inc., New York City

A GROWING field for the contracting organization, and one which the labor conditions of the future promise to increase in size and scope, is the construction of large groups of workmen's dwellings. The company with which the writer is connected has been building a large number of such houses, mainly of wood frame, in the coal mine districts of West Virginia. A description of some of the work will indicate the nature of the operations.

STREET IN WEST VIRGINIA MINE HOUSING DEVELOPMENT, SHOWING CLEARING TO BE DONE

The principal group of dwellings comprises the single-family four-room houses for the West Virginia Coal & Coke Co., of Elkins, W. Va., and for the McCaa Coal Co., of Gilmer, W. Va., which are illustrated herewith. They are of a type developed by the former of the two companies, of semi-bungalow style, with plain gable roof, ample window openings and of box-like form which entails the least waste of space.

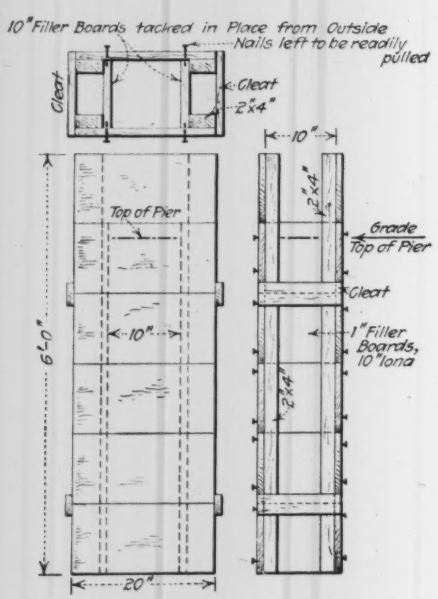
These houses cost about $1200 each, which is not great when consideration is taken of the character of the houses and the current war prices. Briefly described, they contain one living room, two bedrooms, and a kitchen, each 11 ft. 4 in. x 13 ft. 4 in. A small room, 6 x 10 ft., off the kitchen provides pantry space, and there is a 6 x 10-ft. "commode" adjacent to one of the bed rooms. A central flue, consisting of two columns of 8 x 10-in. tile encased in brick, takes care of the four rooms—that is to say, provision is made for a range in the kitchen, stove in one bedroom and open fireplaces in the living room and front bedroom. The house is plastered throughout with one coat of wood fiber plaster finished off smooth. This is cheaper than two or three

coat plaster work and just as good. The walls are left unpainted when new and painted after soiled from occupancy.

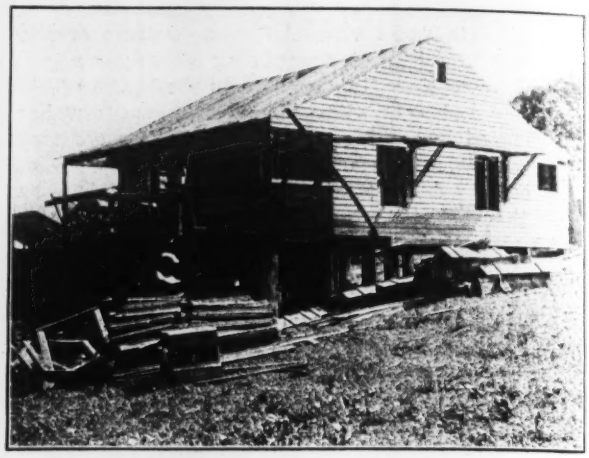
The house is of frame construction throughout, with yellow-pine novelty siding, double floors of either yellow pine or native hardwood and paper between, redwood doors, and concrete or native stone foundation posts. The frame is of hemlock and the roof sheathing of native hardwood covered with Carey Ready roofing, or asbestos shingles. All of the houses are painted forest green with buff trim.

From a construction standpoint, the only difficulties were those entailed by the scarcity of labor and shortage of materials. One man was continually employed in searching for and shipping in laborers of all classes, and as a further aid in this direction particular attention was paid to the proper housing and feeding of the employees. Board and lodging was supplied at $5.95 per week, which was below cost, but the loss on the camps was considered good policy and productive of better results than would be obtained by the expenditure of a like sum in higher wages.

An average of 100 men was employed at each of the three sites, Roaring Creek Junction, Bower and Gilmer, and an average of two houses was constructed per day. A considerable portion of this force was employed in cleaning, grubbing, road grading and ditching. The men were organized into gangs for different purposes, one gang at each site cleaning and grubbing, one building roads, one installing foundations, one erecting the house frames, one on siding, sheathing, etc., one lathing, one plastering, one installing trim, one painting, one installing sewers and water lines, and so on. In effect, each gang was of such size and so spaced with reference to the one following that several days' work intervened and there was little overlapping or interference, and yet a healthy rivalry existed. The same sort of rivalry was established between the work at Roaring Creek Junction and Bower; these two groups of houses




REUSABLE WOOD FORMS FOR 10-IN. CONCRETE PIERS



FRAME "COMPANY HOUSE" UNDER CONSTRUCTION

being of about the same size and having been started on virtually the same day. The superintendent of each site knew daily the progress at the other and each endeavored to excel.

To maintain further a definite schedule, a chart was devised before beginning operations, which chart showed the projected schedule of time of beginning and time of finishing each class of work. On this chart was plotted daily the actual work accomplished, thereby showing at a glance which classes of work were ahead or behind the class of work preceding or following. The various gangs could readily be augmented or diminished so as to make the whole work progress uniformly and without friction between the various gangs.

One thing which contributed to the speed was the use of a central sawmill where every piece of timber was cut to template to standard and exact size. These pieces were marked and piled according to size. From these piles the material was transferred to the house sites and erected by labor less skilled than would be necessary otherwise, and in less time.

Another detail which saved time and material was the design of the foundation concrete forms. The accompanying drawing shows this design, which permitted of the minimum number of forms being required, and also was readily adjustable to the variations in pier height. The concrete could be stripped while comparatively green, no wire or rods being used in the forms and virtually no nails to hold the short cross-boards. The forms were made up in standard lengths of 2, 4 and 6 ft. The side pieces were tacked on, with projecting nails to facilitate drawing, to the required pier height. Concrete was then poured and when set the forms were stripped by pulling nails and releasing side pieces, after which the cleats could be knocked off and the forms would fall away. Each set of forms was used about 15 times and were still good at the end of the work.

The large increase in industrial activity in the United States since the beginning of the war and the attendant shortage of labor have directed the attention of owners and operators to the better housing of their employees. With labor rates increasing rapidly and with competition in the obtaining of labor on the part of employers reaching a point where all sorts of unprecedented induce-

ments are being offered to obtain and to *hold* help, many operators have deemed it economical to gain greater control over their employees through the establishment of "company houses." In many cases, the rapid expansion of industrial enterprises has been such that the available supply of privately owned houses has not been sufficient to meet the demand, and no choice has been left the operators but to build houses of their own. In other cases, the building of new plants, and the opening of new mines in locations where no housing facilities previously existed, made the same course necessary.

This was the situation which led to the building of the houses described. But in many other cases the underlying reason which impelled the owners to establish their own groups of houses has been the desire to provide housing facilities which would be designed for and suited precisely to the particular class of labor employed; to provide houses which would attract labor; to provide houses at rentals which would be lower than possible under any other system; and in some cases to induce the employees to buy their homes under the installment plan—but at all events the ultimate object was the assurance of a steady source of labor, content because comfortable and under control because situated adjacent to the plant. Another consideration, of course, has been the elmination of objectionable institutions in these colonies, the forms of amusement and the educational facilities being under control; the result being an improvement in the work done through improvement in the morale of the men themselves. Whatever have been the reasons leading to the growth of the custom of building "company houses," the fact is that such growth has reached proportions which lend wide interest to the study of the design and construction of such houses.

One of the present tendencies in manufacturing plants is toward the multi-family house, the two family and four-family types being popular. Where manufacturing plants are situated near cities of some size, and where land is costly, the multi-family house is cheaper in first cost per family, both as regards the cost of the land and also as regards the cost of the house. In other words, more families can be housed per acre in two- and four-family houses than in single houses. Also, the cost of a two-family house is not double that of a single house. At the same time, these multi-family houses can be made very comfortable as well as attractive in appearance, and they have some advantages in the cost of maintenance, heat being cheaper per family, for example.

However, the single house has certain decided advantages. Where the topography is rough, as was the case with the single-type houses illustrated, the single house is more flexible and can be fitted to the ground more easily than can the multi-family house. Where it is desired to sell the house to thc tenants, transfer of title can be arranged more simply with the single house. The question of gardens and yard space arises when building multi-family houses, particularly in the case of four-family houses, the two upper families being without these desirable adjuncts to a home. The same question arises in the matter of cellar space. But of greatest importance of all is the fact that friction often develops among the families in multi-family houses, and the quarrels which occur among two or more families living under the same roof considerably discounts the benefits of the entire "company-house" system. Wherever practicable, the single house should be built, with the idea of encouraging each family to take pride in the neatness and appearance of its own surroundings.

The work at Roaring Creek Junction and Bower was done under the general direction of G. B. Southward, chief engineer of the West Virginia Coal & Coke Co. and under the supervision of A. E. Finley, superintendent of the McCaa Coal Co., at Gilmer. R. H. Chambers, vice-president, had general charge and L. E. Frissell was local manager for the contractor, the Jarrett-Chambers Co., Inc., New York City.

# Two Methods of Maintaining Gravel Roads in Maine

### Density of Traffic Is Criterion—Chief Reliance Is Placed on Annual Tar Treatment—Frost Is Worst Enemy

IN ORDER to illustrate the two general methods of maintenance of gravel roads employed by the Highway Commission of the State of Maine, I have selected two state highways which may be considered typical with respect to the amount of traffic carried and the methods followed, said Paul D. Sargent, chief engineer of the commission, in a paper read before the recent meeting of the American Association of State Highway Officials, from which the following has been abstracted.

It should be understood that the methods to be described have application to first-class gravel roads on which the subgrade has been carefully built in accordance with the highest type of specifications, and subdrainage and surface drainage provided at every place where the need seemed apparent. The surface is constructed in two courses very much in the manner of a a waterbound macadam road, except for the substitution of gravel for the crushed stone. The maximum diameter of stone in the bottom course is 3 in., varying from that size down to ¼ in. This course after rolling is 3 in. thick. The top course is constructed of material varying in size from 2 in. to ¼ in., the layer being 4 in. in thickness after rolling. While this specification has been slightly modified since 1914, the remarks which follow would apply equally well to either this or the more recent type of construction.

On State Highway "A" Kennebunk, the traffic for the four summer months amounts to an average of over 1200 vehicles per day, and on Sundays and holidays this is increased to between 3000 and 3500. This stretch of road has been maintained for the past three years by early patching and dragging, and shaping with gravel—the work beginning as soon as the snow has left the ground, and about the middle of April the surface of the road has softened up so that this can be done satisfactorily. About May 20 the road, prepared by sweeping with a horse sweeper and hand broom to remove any loose particles of dirt or dust, receives an application of Tarvia-B at the rate of about $\frac{4}{10}$ of a gal. per sq. yd. of surface. While formerly the tar was allowed to penetrate undisturbed for about half a day, now the traffic is so heavy that it has become necessary immediately to follow the application of the tar with a light

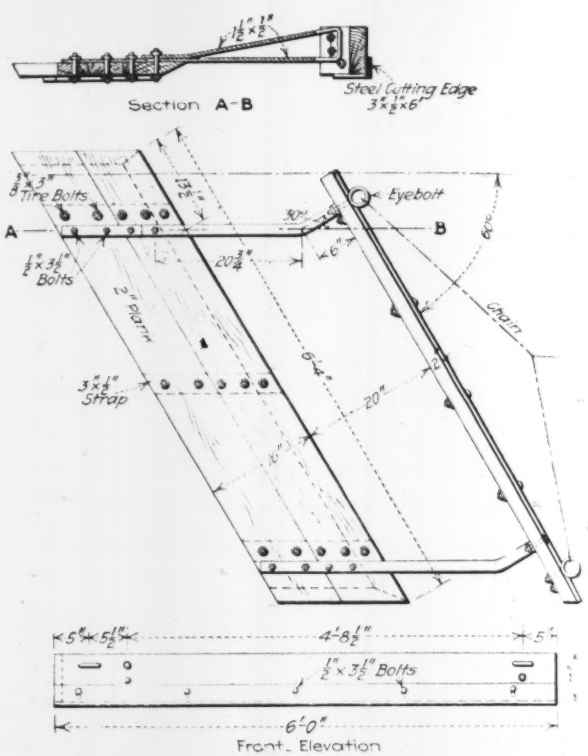
covering of sand spread at the rate of 1 cu.yd. to about 100 sq.yd. of treated surface.

This method of surface treatment was originally used in 1915, the first application amounting to about $\frac{3}{10}$ of a gal. per sq.yd., being made between May 20 and June 30. This was followed with a second application about the middle of August which amounted to about $\frac{2}{10}$ of a gal. per sq.yd. Since the first year the treatment has been confined to one application of Tarvia-B spread at the rate of $\frac{4}{10}$ of a gal. per sq.yd. as soon after May 20 as weather conditions will permit.

The work of preparing the surface for this treatment, as well as the delivery and application of the sand, is carried out by labor employed by the commission. The superintendent of maintenance controls the amount of tar used, varying it from section to section of the road as circumstances demand—though, until this year, the tar has been applied by the concern from which it has been purchased. This control over the rate of application is very important, since in places where the drainage and surface conditions are perfect the continuity of the surface remains unbroken throughout the winter, and in the spring requires sometimes as little as $\frac{1}{8}$ or $\frac{1}{4}$ of a gal. per sq.yd. This condition is unusual, however, since most of the surface begins to break up soon after freezing and thawing begins in the fall, and is completed soon after the snow leaves the ground in the spring—the tar crust breaking up into scales of perhaps $\frac{1}{4}$ to $\frac{1}{2}$ in. in thickness, and from 1 in. to 1 ft. sq. in area.

This factor comprises the really difficult part of gravel road maintenance. Experience has shown that frequent dragging, undertaken as early as is possible and while there is still more or less moisture in the scales, produces the best results. Several miles of gravel surface carried through three successive seasons in the above manner have proven it satisfactory.

While in general the surface begins to iron out in three or four days, though of course this is dependent upon weather conditions, any pockets of dust or soft places in the gravel surface will precipitate immediate disintegration and call for attention from the patrolman. If this condition is noticed as soon as it becomes manifest, a slight amount of tar applied with an old broom will prove a sufficient remedy, but if it is allowed to continue for even a little while, the patrolman will find it necessary to fill the hole with a mixture composed of 1 gal. of tar to a cu.ft. of sand.




MAINE HIGHWAY COMMISSION HAS DEVELOPED LIGHT ROAD DRAG TO HIGH EFFICIENCY

A similar type of disintegration is frequently noticed at the side of the road, where, on account of traffic turning out, the mat will often crumble and require patching with the mixture of sand and tar referred to above.

Where gravel roads carry a traffic of from 200 to 500 vehicles per day during five or six months in the year, and where the maximum traffic amounts to about 650 per day, no bituminous material is used in maintenance—entire reliance being placed on the work of a patrolman, who, with one horse, a drop-axle wagon, a light drag and ordinary small tools, is expected to take

WEIGHT OF TRAFFIC IS REFLECTED IN COST OF MAINTENANCE

| | STATE HIGHWAY "A" KENNEBUNK 2.74 Miles of Gravel Surface Treated with Tar | | | STATE HIGHWAY "D" WALDOBORO 7.09 Miles of Gravel Surface | | |
|---|---|---|---|---|---|---|
| | 1915 | 1916 | 1917 | 1915 | 1916 | 1917 |
| Patrolman's wages | $209.81 | $329.16 | $417.53 | $546.98 | $529.17 | $627.69 |
| Extra help | 91.28 | 624.57 | 450.59 | 89.19 | 463.25 | 1,227.56 |
| Material | 1,036.99 | 1,309.49 | 1,250.68 | 00.00 | 51.42 | 180.94 |
| | $1,338.08 | $2,263.22 | $2,118.80 | $636.17 | $1,043.84 | $2,036.19 |
| Inspection | 25.10 | 182.03 | 175.00 | 7.67 | 18.57 | 30.00 |
| Total cost | $1,363.18 | $2,445.25 | $2,293.80 | $643.84 | $1,062.41 | $2,066.19 |
| Cost per square yard | .053 | .095 | .088 | .0096 | .016 | .03064 |
| Cost per mile 16 ft. wide | 497.51 | 892.43 | 837.15 | 90.80 | 149.84 | 291.42 |
| DISTRIBUTION OF COST | | | | | | |
| Cutting bushes | $00.00 | $26.82 | | | $5.76 | |
| Dragging | 112.28 | 67.54 | | $208.74 | 153.15 | |
| Raking rocks | 16.38 | 21.70 | | 180.77 | 75.11 | |
| Cleaning ditches and culverts | 24.00 | 24.67 | | 177.86 | 39.93 | |
| Repairing endwalls and culverts | 8.12 | 82.10 | | | | |
| Repairing guard rails | 0.00 | 7.59 | | | | |
| Surfacing gravel | 23.19 | 534.91 | Date not distributed | 68.80 | 767.01 | |
| Surface treatment: Tar | 1,154.11 | 1,494.39 | | | | |
| Bridges | 0.00 | 3.00 | | | 2.88 | |
| Total | $1,338.08 | $2,263.22 | | $636.17 | $1,043.84 | |

care of from six to eight miles. As soon as the snow has left the ground the patrolman begins dragging the softened surface, raking off loose rocks and patching depressions with gravel which has been distributed along the sections at about every 1000 to 1500 ft. This patrolman must also keep ditches and culverts clear, make necessary repairs to end-walls and guard rails, and keep the weeds trimmed off the shoulders and the sides of the road.

Roads maintained in this manner require resurfacing about every two years. Gravel passing a 1¾-in. screen, and which is similar in every respect to maintenance gravel, is spread at the rate of 1 cu.yd. per 100 sq.ft. This work is not undertaken until traffic has begun to lessen after Labor Day, and it is generally completed before Nov. 15. No roller is used on this work, dependence being placed on traffic and the attention of the patrolman who constantly uses his drag to shape the new layer while it is consolidating. Very frequently consolidation is not effected until after the first frost and the section has been dragged a few times in the spring. After this the new material has become thoroughly bonded to the old surface and to all intents forms a new gravel road.

Quite extensive resurfacing operations were undertaken during the winter of 1916-1917. Men and teams are more available at that season of the year, and it was also found that teams could haul from 2 to 3 yd. of gravel at a load, as against 1¼ to 1½ yd. if wagons were used instead of sleds. The gravel was delivered in windrows on one shoulder of the road and, as soon as the snow left, it was dragged to the roadway with a road machine. Taken as a whole, this method of handling the surfacing has proven very satisfactory, and it is planned to repeat the use of the method during the present winter.

During the coming season we expect to combine three or four patrol sections and furnish the men with a 1-ton tractor, five of which have been purchased. This rearrangement will result in a gang of three or four men who will have charge of from 18 to 25 miles of road. It is believed that this arrangement will prove more economical than our present plan of employing four men, four horses, and four sets of equipment for a similar length of road.

# Protecting Submerged Steelwork of Arch Bridge

## Ends of Steel Arches Submerged by Government Dam To Be Protected by Enclosure Wall and Encasement with Pitch

THE building of the government dam between St. Paul and Minneapolis, described in *Engineering News-Record* of Oct. 4, p. 628, has raised the water in the Mississippi River over the tops of the piers of the Marshall Ave.-Lake St. bridge. The steel of the arches will be submerged about 5 ft.; in extreme high water the submergence will be at least 12 ft. This bridge is a two-span pin-connected arch bridge having 456 ft. three-hinged steel arches, flanked by short shore truss spans. It connects two arterial streets in Minneapolis and St. Paul and carries one of the interurban car lines between the two cities.

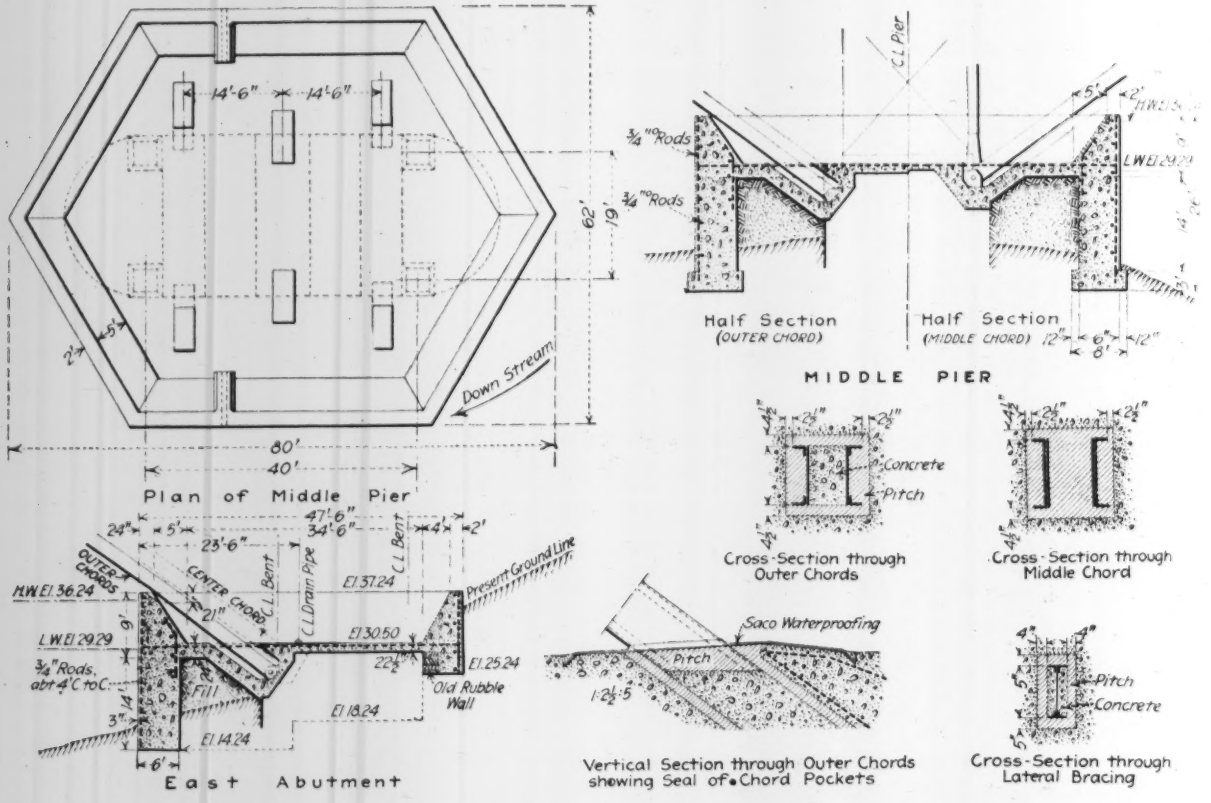
The submerged steel is to be protected by building concrete protection walls around the shore abutments and the center pier to a point 1 ft. above the estimated high water. Within and partially supported by these walls there will be a reinforced-concrete slab built over the top of the present masonry, just above normal stage of water due to the dam, with pockets built of concrete for the arch ribs and laterals. These pockets will be filled with a bituminous putty of such consistency that the arches will remain free to adjust themselves under different loadings or temperature stresses without cracking the bond between the steel and the protecting putty. The slab floor will be finished with a 1-in. mortar surface sloping away from the steel toward the outlet valve.

END OF ARCH FORMERLY WELL ABOVE WATER IS NOW SUBMERGED

The retaining wall will be about 7 ft. higher than the slab floor and will act as a protection to the arches from floating drift and ice in high water. Rainwater caught in the inclosure will drain off through weep holes and valves, as will also water coming into the inclosure during periods of high water. It is the intention to allow the water to rise in the basin to the same height as outside, depending on paint to protect the steel above the sealed pockets. If this is not satisfactory, the valves may be closed during high-water periods and the inside of the basin waterproofed. Also, the valves may be

closed at any time during a high-water period and the water pumped out if it is found necessary to inspect or repair the steel.

All steel below 4 ft. above high water is to be cleaned by sandblast and painted with Sarco metal primer and then with Sarco mineral-rubber pipe coating No. 6. The inside of the concrete pockets will be painted with Sarco concrete primer, and after the bituminous putty is placed (hot) the top of the pockets and the surrounding concrete is to be sealed with waterproofing compound. Rod or wire-mesh reinforcing will be used in the thin concrete sections forming the pockets. The space to be filled with putty will be decreased by filling in the interior of the steel arch chords and around the shoes with concrete where it is practicable to use this method.




MAIN DETAILS OF PROTECTION OF SUBMERGED STEELWORK, MARSHALL AVE.-LAKE ST. ARCH BRIDGE

At the center pier this protection will form an island basin 62 ft. wide and 80 ft. in extreme length. The abutment structures will be 60 x 47½ feet.

The dam is now unwatered to allow the construction of the protection work to proceed. The contract for the east pier has been let to Thornton Bros.., of St. Paul, for $9873. Specifications are now being prepared for a joint contract to be let by the two cities for the work on the center pier.

This work was designed and is being executed, under the supervision of Oscar Claussen, chief engineer of St. Paul, by M. S. Grytbak, bridge engineer. M. N. Goss is Commissioner of Public Works of St. Paul. Frederick W. Cappelen is city engineer of Minneapolis.

## Motor Trucks Beat Trains in Troop Movement

The recent army truck test over the Dixie Highway between the cantonments at Atlanta and Chattanooga, to determine the speed with which troops can be moved in an emergency by motor truck, in comparison with the known rate of travel by cavalry or railroad, proved to be a revelation in showing the higher speed of motor trucks as compared even with express train service.

Army officers were greatly interested in the White truck with a special "Col. Gallagher" troop transport body. Six trucks of other types, carrying regimental supplies, participated in the test and the whole demonstration was closely watched by several French and American army officers, among whom was Lieut. Col. Hugh J. Gallagher, depot quartermaster at Atlanta and designer of the Gallagher body.

The transport covered the route in 5 hr. 30 min. on the outbound trip and 5 hr. 2 min. returning, beating the time of the fastest railroad train between the two points. The six supply trucks required eight hours or more. At times the speed of the transport was as high as 49 miles an hour. Colonel Pierce said the test showed that a whole regiment could be moved over the route in seven hours. The Gallagher body design seats the soldiers back to back lengthwise of the body. The rifles may be stored in rifle chests built between the backs of the seats.

The new transport is expected to eliminate baggage wagons to a large extent inasmuch as lockers under the seats carry equipment and ammunition.

# Five Million Yards Moved To Dam Three Rivers

**Structure for Bridgewater (N. C.) Development Built by Hydraulic Filling Between Outside Embankments—Flow of Two Watersheds Diverted on Third**

THREE large earth dams and two diversion channels, to store water on three rivers for operating a power house near Bridgewater, N. C., are being built by washing the central portion of the fill to place between outside embankments formed by dumping dry material from trestles. All of the earth is dug by steam shovels, the material for filling the center portion of each dam being dumped by train and washed to place with hydraulic giants supplied with water by pumps mounted on a float in a pool between the outside embankments. The level of the pool is raised as the filling progresses, the barge having to be dismantled at the top of the dam. The spillway structure, located in the southerly dam, requires 200,000 yd. of concrete, for which a crushing and mixing plant using local rock has been set up. The work is being handled in two sections, each with its own plant and organization, one including the southerly dam with a spillway, and the larger diversion channel, and the other including the second and third dams, the power house and a 700-ft. rock tunnel supplying it from the northerly reservoir. The plant for handling 5,850,000 yd. of fill required includes 25 locomotives, 150 to 180 dump cars and 10 steam shovels.

MATERIAL DUMPED INWARD FROM FLANKING TRESTLES IS SLUICED TO PLACE AT BOTTOM OF POND BY PUMPS ON RAFT

As will be seen from the map, the three dams under construction will store water in a very irregular area comprising parts of the basins of the Catawba River, Paddy Creek and the Linville River, a few miles above the point where these three streams join. Paddy Creek is to be entirely cut off. The water going over the main spillway will pass down the present bed of the Catawba River. Although the site of the development is in the mountains, it was possible to cut through the low divides separating the three basins at this point, and throw them into one reservoir. The principal cut required is for the diversion channel between the Catawba and Paddy Creek water sheds, and involves about 500,000 yd. of excavation, while only 50,000 yd. will have to be removed between the Paddy Creek and Linville River basins.

In addition to the Catawba River structure, a small concrete dam just north of that river valley, two similar structures between the Linville River and Paddy Creek, and a fourth low dam north of the Linville River, will provide additional spillway capacity, wasting into the Catawba and Linville Rivers. These dams, all of small height and ranging in length from 100 to 200 ft., have not yet been started.

The spillway of the Catawba dam will be about 165 ft. high at the highest point, about 175 ft. thick at the base and 300 ft. long, with a long wing wall on each end. There will be a steel bridge to span this spillway 20 ft. above the crest of the dam and a reinforced-concrete bridge connecting with earth fill on the north end. A surfaced dirt road will be built across all the dams and around the reservoir connecting with Bridgewater and Nebo.

The Catawba River dam, including 150,000 yd. of fill in a notch through the valley wall at one end, will require 2,300,000 yd. of material, and is the largest of the

START OF WORK ON BIG SPILLWAY

main earth dams. Its top elevation will be 1220 ft. above sea level, the average elevation of the present ground surface along the river being 1090 ft. The Paddy Creek dam will contain 1,600,000 yd. of fill, and 1,800,000 yd. of material will be required for the structure across the Linville River. These figures do not include 10% extra material which the contractor is required to place to allow for shrinkage.

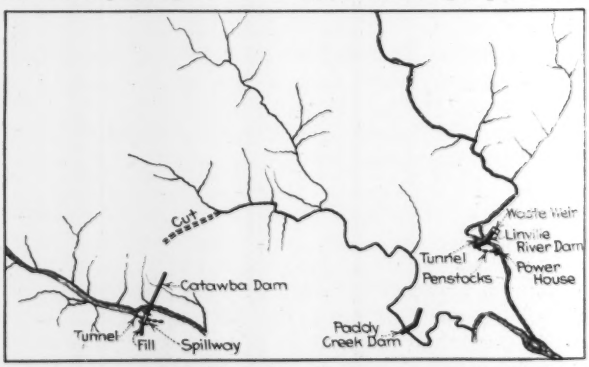
Each of the three large earth-fill dams is being made in 7 lifts, each about 20 ft. high. These lifts are made by dumping material to form an embankment along each side of the dam from dirt trains run out on trestles. The trestles for each successive lift are stepped in to give the required slope on the outside of the fill. These external embankments are about 50 or 60 ft. wide on top. After the central portion of the dam is inclosed to make a pond by these fills, material is dumped from one of these embankments at any point where it is convenient for the floating pump in this pond to work. This pump rehandles the material, distributing it by washing over the central area. The ponds are kept full by pumping from the rivers across which the dams extend. Sufficient water is supplied to keep the barge afloat and to prevent too wide a beach forming at the base of the dikes. This water varies in depth, being sometimes 30 ft. deep at the deepest point.

The equipment used to sluice the fine material to the middle third of the dam consists of three-stage centrifugal pumps driven by 300-hp. motors. These pumps, which furnish 2000 gal. per min. with a nozzle pressure of 175 lb., are situated on barges within the pond inclosed by the dikes. This pond water is used over and over again. Electric current is carried to the barges by means of a three-ply insulated cable supported by barrel pontoons, thus making it possible to move and anchor the barges at any desired position in the pond. The fine material thus washed to the middle third forms an impervious core and leaves an outer skin on both slopes of the dam, of coarse earth and rock. The fill deposited in this way is more thoroughly segregated, it is asserted, than by any other process. As the material used is clay and sand, a very dense and impervious center is being secured. The upper slope of each earth dam is to be 1 on 3, the lower slope 1 on 2½, and the slopes are to be riprapped from 1 to 3 ft. thick with stone.

Even at the Catawba River dam, where the excavation from the diversion channel into the Paddy Creek basin was available, most of the fill for the dams had to be borrowed. At the Catawba River dam, three steam shovels, 11 locomotives and 75 dump cars are required in excavating the diversion channel, borrowing material and making fill for the dam. In addition, a fourth shovel is at work on the foundation for the spillway, and an American crane shovel has been employed in grading for the railroad tracks. The track system connects with the Southern Railway near Bridgewater.

At all three of the dams central cut-off trenches are carried down to rock. These trenches extend across the river bed and up the hillside on both banks of the stream. Owing to the steepness of the banks, they were excavated by sluicing the material from the hillsides down into the bed of the river, whence the material was moved by steam shovels. The Catawba dam is located where the bed of the river is very broad and flat, and the rock is overlain by a bed of large gravel to a depth of about 5 ft., above which is a stratum of soil about 20 ft. in depth. This soil was too boggy to hold up a steam shovel and was removed by digging a small sump hole, pumping it full of water and then floating a dredge boat therein. Water was supplied to the dredge by two centrifugal pumps from the river. This dredge with a centrifugal pump and cutter head removed substantially all of the soil stratum, discharging through a pipe line into the river. The gravel was taken out by a steam shovel after the dredge had been removed and the trench excavated by it drained into the river.

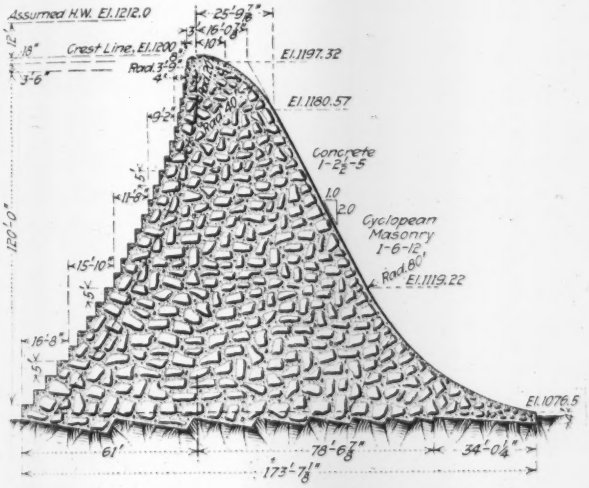
In addition, the bed of the river is to be unwatered at the Catawba River dam in two successive crib cofferdams, and a concrete spillway structure containing 200,000 yd. erected on solid rock. A bend in the river was first partially cut off by a straight crib cofferdam, the water passing to the south, and the larger portion of




THREE VALLEYS WILL BE FLOODED AND THROWN INTO ONE RESERVOIR BY DAMS AND CHANNELS

the spillway foundation to the north being pumped dry. A steam shovel was carried into this hole on a spur track, and used to load the excavated material. It is assisted by a number of large steel guy derricks of the type used by the same contractor on the Yadkin River development. These derricks, of which 17 will be set up at one time on the Catawba dam, will be used to handle all the concrete placed in the spillway section. These derricks have 115-ft. masts and 100-ft. booms and are of 20 tons capacity. The dam is so high above the foundation that two set-ups of the derricks will be necessary to complete it. The dam will be built up as high as the derricks will reach from their first set-up, recesses being left in the downstream slope to erect timber bents on which to set the derrick for the second stage of the work. The concrete will be delivered along the downstream face of the dam in 2-yd. buckets on flat cars.

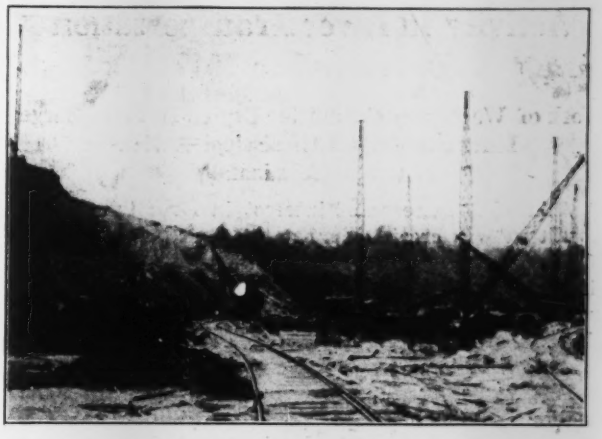
The plant for mixing this spillway concrete, located downstream from the dam on the north side of the river valley, will employ sand and stone obtained locally, the stone being quarried upstream from the dam on the south side of the river. The plant consists of a pair of 2-yd. mixers surmounted by loading bins for stone




MAIN SPILLWAY REQUIRES LARGE YARDAGE OF MASONRY

and sand. These mixers discharge in buckets on flat-cars on a track extending past the south side of the plant. Across this track, above the level of the trains the cement is carried to the charging platform on a belt conveyor. With this arrangement it is not necessary for the cement cars to be switched onto or across the tracks which are used for handling the concrete. Behind this mixing plant are four secondary crushers, to the north of which in turn is the primary crusher, supplied with stone brought by rail from the quarries. The large crusher is a 21K Allis-Chalmers gyratory, and the smaller ones are No. 5 McCullys.

The Paddy Creek dam, not requiring any concrete structures, was constructed rapidly and will soon be completed. The Catawba River structure, on the other hand, could not be carried above the first lift until the spillway was well started. While making the flanking fills for this lift and constructing the cofferdam for unwatering the major portion of the spillway site, the



STEAM SHOVEL DIGS CUTOFF TRENCH AT PADDY CREEK

small dam to the south of this structure was completed. At the same time a start was made on excavating the diversion channel north of the dam. At the Linville River site it was necessary to complete the power house and the tunnel in order to by-pass the river, before the main fill could be carried very far. This tunnel, which is partly in solid, partly in disintegrated rock, is 25 ft. in diameter and 700 ft. long. It is lined with concrete through the solid rock portion and with reinforced concrete through the disintegrated rock. A steel penstock of 1-in. thick metal and 20 ft. in diameter extends from the power house back into the tunnel for about 300 ft. through the disintegrated rock. The concrete in this tunnel was poured from a car for the floor and part of the side walls, and with a pneumatic mixer for the roof, and for the entire section in that part of the tunnel through which the steel penstock extended. Exceedingly good results were realized in spite of the many obstacles encountered.

The power house is a reinforced-concrete structure. It will contain two turbines operating under 140 ft. head, and will have a capacity of 26,400 hp. The power house structure is virtually completed, and the tunnel was finished in July. This made it possible early in October to divert the Linville River and begin construction of the dam proper.

The concrete work and a major portion of the earth work is being carried out by the Hardaway Contracting Co. for the Western Carolina Power Co., which owns and will operate the development. The diversion channel between the Catawba River and Paddy Creek basins is being excavated under subcontract by A. J. Twiggs & Sons. The entire work employs about 2000 men, 1200 of which are in Camp No. 1 on the Linville River, and 800 in Camp No. 2 on the Catawba River. Both camps are in charge of S. T. Jones, general superintendent for the Hardaway Co. The Western Carolina Power Co., of which W. S. Lee is vice president and chief engineer, is represented by F. H. Cothran, resident engineer.

### Speed in Locomotive Building

The Baldwin Locomotive Works, Philadelphia, recently announced the completion of a locomotive built in 20 working days. The engine was one of a number ordered by the U. S. Government for foreign service July 18, and the first one was completed Aug. 9.

# Activity in River Transportation Developed in 1917

## Work of Waterways Committee Begins To Tell—Barge Lines Starting on Mississippi—Attention to Terminals

MARKED increase of interest in river transportation was created during the past season by the efforts of a water transportation committee of the Council of National Defense. Active river shipping is in prospect for next season. The coöperation of the Shipping Board in the construction of steel barges, and the formation of local corporations to develop river terminals, give assurance with respect to two of the main factors on which river transportation will depend. Full coöperation by railways to develop the freight-carrying capacity of rivers is also counted on. This, however, will depend in part on rate adjustment.

The principal growth of interest has been in the Mississippi Valley. Capt. A. A. Poland, of the Quartermaster's Reserve Corps, has been assigned to the U. S. Engineer Office at St. Louis as representative of the water transportation committee. This provides a central point for contact between business men, capitalists and the interests concerned with barge lines and river terminals, on the one hand, and manufacturing interests dependent on regular and quick transportation service, on the other.

### Some Mississippi River Developments

To develop the possibilities of shipping pig iron from Alabama to Illinois, the Keystone Steel & Wire Co., Peoria, shipped by water from Florence, Ala., to Peoria during part of the summer. Barges were borrowed from the Pittsburgh coal fleet, and an 80-ft. canal, a mile long, was dug from the Illinois river to the company's plant. Pig iron was diverted from the all-rail route to Florence, and thence taken by barge down the Tennessee River and the Ohio, and up the Mississippi and Illinois. Two trips were made and a very distinct economy in transportation cost was shown, as compared with all-rail costs. The company is preparing to build boats and barges for next season.

A line of twelve barges, served by three towboats, is carrying bauxite from West Memphis to East St. Louis for the Aluminum Ore Co. The material is handled by a car dumper at West Memphis and loaded to cars by clamshell at East St. Louis. This service employs steel barges originally constructed for the American Steel & Wire Co. Return cargoes (partial) are secured through the Memphis Barge Line, which ships package freight downstream from St. Louis to Memphis, loading at the O'Fallon St. municipal dock by chutes and a locomotive crane.

Bulk-freight transportation by barge from St. Louis to St. Paul and return has recently been given a thorough tryout on a large scale, as reported in our news columns. The basis of this service is the movement of coal from the southern Illinois fields to St. Paul, and shipment of Lake Superior iron ore from St. Paul to East St. Louis. E. F. Goltra, of the Mississippi Valley Iron Co., and W. K. Kavanaugh, of the Southern Coal Mining Co., St. Louis, are actively engaged in the enterprise. The ore chute in the floor of the Terminal Railway bridge at St. Paul, described in *Engineering News-Record* of Oct. 4, p. 638, was constructed for the transfer of ore from railway cars to the barges.

For this barge service experiment, six barges were lent by the Mississippi River Commission. The trip north was made in two weeks, in the early part of August. Some delay was incurred in loading and unloading, but the return trip was started in the latter part of August. Overloading of the barges and low water in the river combined to create many delays; the trip down occupied six weeks. The tow picked up five additional wooden barges on the way, however.

The Kansas City-Missouri River Navigation Co., which has been operating nine barges and two towboats between St. Louis and Kansas City for seven years, had a very active season. This line operates on a five-day schedule, between a municipal dock in Kansas City and a private dock at East St. Louis. The terminals are equipped with conveyor and telpher. Steel double-hull barges are used in this service. Freight claims amount to less than ½%. The company offers through rates with railroads and can issue foreign and domestic bills of lading. Its rates are materially below rail rates. The docks have rail connections. No bulk freight is carried. Package freight—the most costly class to handle—is loaded and unloaded for $1.10 per ton, which with switching charges makes a terminal cost of $1.40 per ton. Unusually low water stopped this traffic late in October, a few weeks earlier than in normal years. The barges are expected to go into service between St. Louis and New Orleans.

An Illinois River barge line is to be formed, through the activity of business men in the Illinois valley. There is a big downstream business available along the river, including large tonnages of sand. The Illinois Valley Manufacturers' Association, with headquarters at La Salle, Ill., is active in promoting the enterprise.

### Terminals To Be Built or Building

The St. Louis municipal dock, a reinforced-concrete wharf with elevators and conveyors to handle freight at all stages of the river, is under construction and is likely to be well along toward completion next season.

Memphis, Tenn., has issued $500,000 bonds for the erection of a river terminal. The city's engineers are now actively engaged in planning this terminal and expect to begin building at once, so that the structure will be completed by next spring.

A terminal is being built at Alton, Ill., by the Illinois Terminal Ry. for Mississippi and Missouri River freight traffic. The city of Davenport, Iowa, is also developing a terminal. It has built a seawall on the harbor line in front of the city, and by filling in behind the wall has reclaimed 40 acres of valuable land, which will be utilized to build up an industrial district with a river terminal along its edge. Loading and unloading devices are to be installed. The first unit is about completed, including a concrete and brick freight warehouse. (See *Engineering News-Record*, June 7, 1917, page 481).

A similar terminal is being completed at Muscatine, Iowa. Here an electric conveyor, an electric crane, and a marine leg for loading and unloading bulk grains will be installed, making this one of the most complete terminals on the Mississippi River.

At Moline, Rock Island, Quincy, Clinton and Hannibal committees are at work selecting sites and planning water terminals, Dubuque has spent $5000, and Keokuk has plans for a terminal, with every prospect that work on these will go ahead.

The cities of St. Paul and Minneapolis, each of which has constructed a municipal dock, are planning for the installation of freight-handling machinery. The Minneapolis dock at present has no equipment, while the St. Paul dock uses a derrick in place of the locomotive crane it was originally intended to use.

On the Illinois River, Peoria and La Salle are entering upon the construction of terminals. Peoria is likely to undertake terminal construction as a municipal enterprise, for which bonds are to be issued by the city. The La Salle project will probably be undertaken by local business men.

All these terminals will have direct railroad connection, this coördinating rail and water transportation.

The present activities on the Mississippi are largely concerned with bulk-freight transportation. There is associated interest in package-freight service, however, similar to that operated by the Kansas City-St. Louis line and by the returning ore barges from St. Louis to Memphis. As such service depends on the general interest and participation of shippers of package-freight in the river cities, work is now centering on creating such interest.

Close consideration is being given also to the subject of freight insurance. It is considered satisfactorily demonstrated that river freight in steel barges is entitled to low insurance rates, especially because the Great Lakes shipping, which is much more hazardous, receives moderate rates. If the steel barges that will be available next season do not receive low rates from the existing insurance companies, it is probable that means for providing this insurance in river cities will be found.

As announced a month ago, the U. S. Shipping Board has undertaken the construction of some 36 steel barges for Mississippi River traffic. This action assures priority for the material required. The barges will be 48 x 300 ft. in size, with a capacity of 900 tons on 4-ft. draft.

---

### American Export Cement Skillfully Packed

Grosvenor M. Jones, special agent of the United States at Santiago, Chile, has forwarded a report to Washington, stating that American cement deserves a high place on the honor roll on account of its good export packing. During a tour of the west coast of South America hundreds of barrels of American cement were seen, and with comparatively few exceptions they were in excellent condition when they arrived. Photographs which were taken recently at Santiago, Chile, of cement shipments, one lot from the United States and the other from Europe, furnished a contrast which was favorable to our shippers. The European lot was on a lighter alongside the dock. The heads of several of the barrels were broken in. The American lot seen on one of the docks revealed no such defects in packing. The barrels had a strip of board across each head, a protection which is always found on American cement packages but not on other barrels.

## Syracuse Tests Two Methods of Sewage Treatment

### Activated-Sludge Process Being Studied Alongside Dortmund Tanks Combined with Aerated Continuous Gravel Filters

IN SEPTEMBER, Syracuse, N. Y., added its name to the long list of cities which have installed experimental sewage-treatment plants. The activated-sludge process is being tested, as is also a combination of Dortmund settling tanks and artificially aërated continuous gravel filters, similar to those tested at New Rochelle, N. Y., in 1916, by James C. Harding, consulting engineer, New York City.

Before these two processes came to the front Imhoff tanks and sprinkling filters had been favorably considered for the treatment of the sewage of Syracuse. That method would have required a force main about four miles long and a relatively high pumping head. If one of the two processes now being tested proves satisfactory, the four-mile force main will be unnecessary, as it is believed that either of these processes could be operated near the terminus of the intercepting sewer.

#### Grit Chamber, Screens and Dortmund Tanks

At the testing station, crude sewage is pumped to a grit chamber consisting of a long narrow box divided into two compartments to give a total channel length of 30 ft. The sewage then passes through a coarse screen of inclined bars, ¾ in. clear spacing, to an orifice chamber. Through one orifice the activated-sludge tank is supplied, and through two others the sewage passes to two Dortmund tanks. One Dortmund tank supplies settled effluent to a horizontal-flow and the other to a vertical-flow aërated gravel filter.

The activated-sludge installation embraces an aërating tank 4 ft. wide, 12 ft. long and 10 ft. sewage depth. Perforated diffusers extend transversely across the aërating tank in the bottom of V-shaped troughs. These pipes are 24 in. on centers, 1 in. in diameter, with $\frac{1}{16}$-in. perforations, 3 in. c. to c. The aërated sewage goes to a settling tank 4 ft. square, with a maximum water depth of about 15 ft., the bottom being hopper shaped, with slopes of 4 on 1. From this tank an air lift delivers the sludge back to the aërating tank or, if desired, to a reaëration tank, 4 ft. square, with a water depth of about 11 feet.

The two Dortmund tanks are each 3 ft. 7 in. square and 12 ft. deep.

#### Horizontal- and Vertical-Flow Filters

Each aërated filter is 4 ft. wide and 8 ft. long, and is filled with gravel which has passed a ¾-in. screen and has been retained on a ½-in. mesh screen. The depth of gravel is 4 ft. in the horizontal-flow and 5 ft. in the vertical-flow tank.

In the horizontal-flow tank the sewage is discharged through a manifold of 1 in. pipe perforated with ¼-in. holes. The sewage then flows longitudinally through the tank. The air pipes in this tank are laid in transverse ridges, 12 in. c. to c., having 1 to 1 slopes. These pipes are perforated with $\frac{1}{16}$-in. holes, 3 in. center to center.

The vertical-flow tank has 5 ft. depth of gravel. The

troughs in the bottom are 6 in. c. to c., 3 in. deep, run transversely and contain, alternately, an air-supply and an effluent pipe. The air-supply pipes have $\frac{1}{16}$-in. and the effluent pipes $\frac{1}{4}$-in. perforations, all 3 in. center to center.

Both the horizontal- and the vertical-flow tanks are back-washed every eight hours with air, supplied from a storage tank. The pressure starts at about 50 lb. and diminishes until the air is used up. Air-washing takes about 2 to 4 minutes.

A low-pressure blower supplies air at from 6 to 8 lb. pressure for both the activated-sludge process and the aërated filters. Various rates of air supply are being tried in each process. It is too early to give comparative results. In general, both processes show promising results, but whether the gravel filters can be kept clean remains to be seen.

Glenn D. Holmes is chief engineer of the Syracuse Intercepting Sewer Board, and Jacob Cohen is engineer in charge of the testing station.

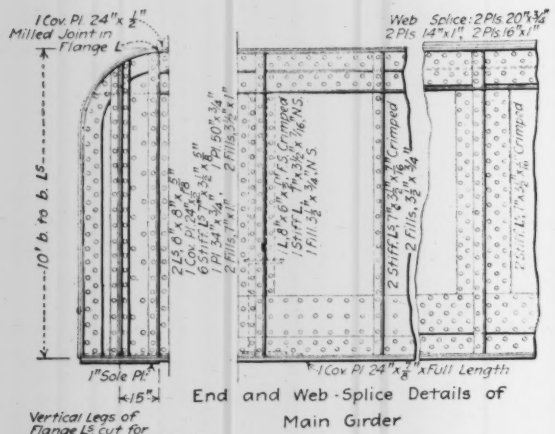
# New York Central Sets Long Plate Girder in Bridge

## Two Wrecking Cranes Place 105-Ton Member, 131½ Feet Long and 10 Feet Deep, in Complicated West Shore Crossing

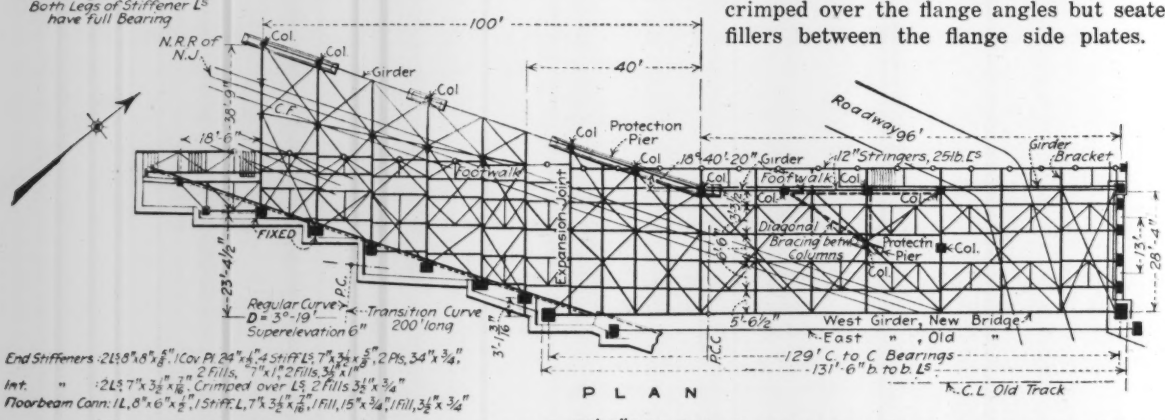
THE New York Central R.R. now has on its West Shore line one of the longest bridge plate girders in existence. This is a girder 131½ ft. long over all, weighing 105 tons, which forms part of a complicated crossing over the Northern R.R. of New Jersey (an Erie line) near New Durham, N. J. It was set in place Nov. 11; two heavy railroad wrecking cranes handled the operation in simple and rapid style.

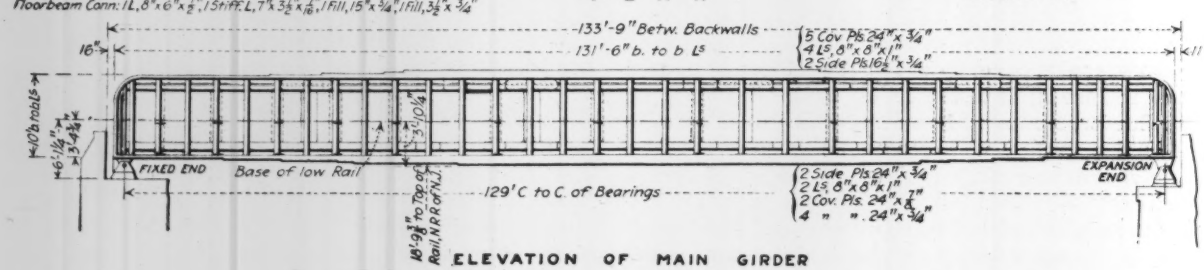
The West Shore Railroad now has under construction a short stretch of third- and fourth-tracking between the westerly end of their yard at New Durham, N. J., and the southerly end of the yard south of Little Ferry, a distance of approximately 1.6 miles. This involves duplicating most of the existing structures. The crossing over the Northern is on a very long skew, and is complicated by a highway at the lower level, which interrupts the line of the abutment and makes the new structure different from the old. The new structure, which lies west of the old, is carried on one side by a girder 129 ft. long c. to c. bearings, and on the other side by columns set outside the clearance width of the Northern tracks.

In design, the long girder is substantially normal, except for size. The web is 120 in. deep. The top flange is of four-angle section, but the bottom flange, where an extra line of angles would have interfered with the floor-beam connections, has only the usual angle pair of flange angles, but is fitted with six cover plates instead of five as on the top flange. The web stiffeners are 7 x 3½-in. angles (floor-beam connections 8 x 6-in), crimped over the flange angles but seated on fillers between the flange side plates. The


1 Cov. Pl. 24"x 1"
Milled Joint in Flange L
Web Splice: 2 Pls. 20"x¾"
2 Pls. 14"x1", 2 Pls. 16"x1"
10' b. to b. Ls
1" Sole Pl.
15"
1 Cov. Pl. 24"x⅞" x Full Length
Vertical Legs of Flange Ls cut for 8"x8"x⅝" End Stiffeners. Both Legs of Stiffener L have Full Bearing

End and Web-Splice Details of Main Girder




ELEVATION OF MAIN GIRDER

COMPLEX CONDITIONS AT EXTENSION OF WEST SHORE BRIDGE 4, REQUIRING PLATE GIRDER 129 FEET LONG CENTER TO CENTER. (PLAN OF BRIDGE AND ELEVATION OF GIRDER)

WRECKING CRANES READY TO LIFT 105-TON GIRDER OFF CARS

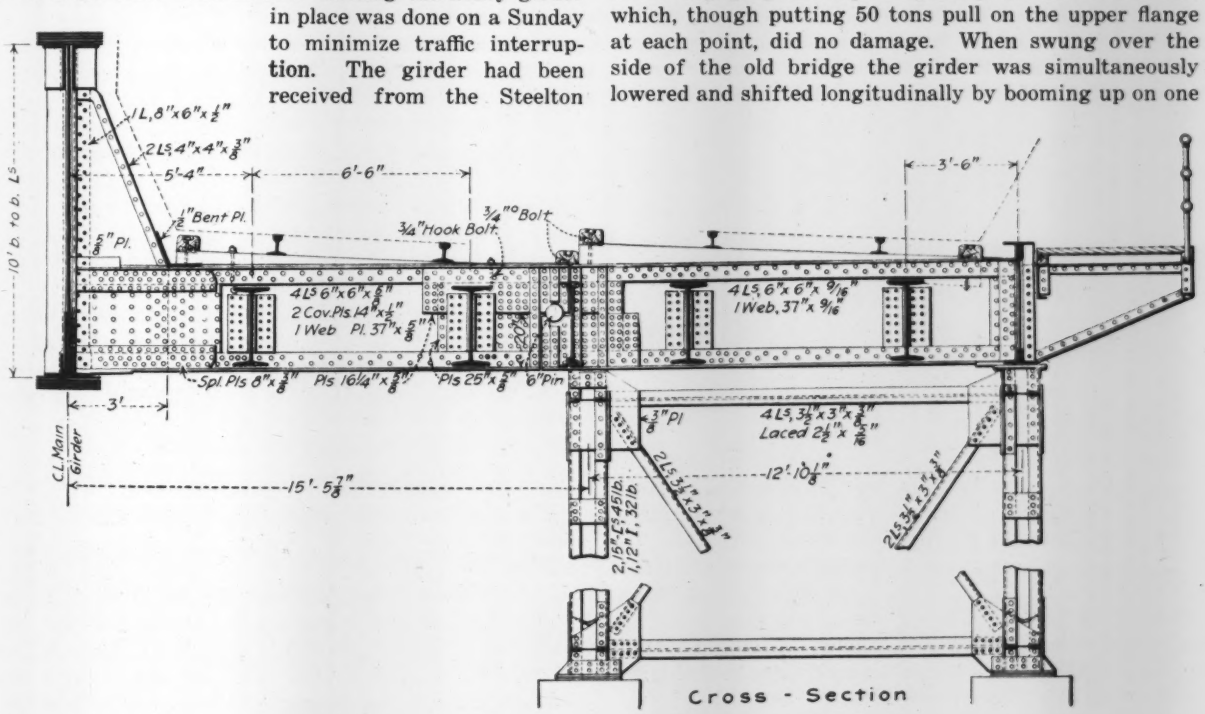
LIFTING GIRDER OVER WEST GIRDER OF EXISTING BRIDGE, READY TO SET ON SHOES

flange cover plates are each about 5 ft. longer than the theoretical length, the extra length being utilized to splice the cover plates lying below.

In the floor construction the support of floor-beams at certain points involved some novelty. Columns support the west girders (the long girder is on the east side), and for lateral stability these are braced as a tower with columns placed under the middle points of two floor-beams to reduce the load on the long girder. The short floor-beam extending inward from the long girder to column has a pin connection to the floor-beam seated on a tower column, as sketched in the drawing. This detail was considered necessary to avoid excessive bending in the floor-beam as the long girder deflects.

The floor was made as shallow as possible because the bridge is situated at the summit of a grade in the West Shore tracks, with an 0.8% gradient northbound and a 0.5% gradient southbound. Setting the heavy girder in place was done on a Sunday to minimize traffic interruption. The girder had been received from the Steelton plant of the Bethlehem Bridge Co. some time before, being unloaded and held in yard storage for about a month while the masonry was being completed. For erection it was set on three flat cars and these were run out on the west track of the old bridge. Two heavy railroad wrecking cranes were brought up to the ends of the girder, on temporary tracks turning off the permanent track, in such a way as to bring the booms directly over the final position of the girder. One of the cranes was a new 150-ton Bay City wrecker, the other a 120-ton machine. The cranes had to lift the girder off the car, swing it outward and over the west girder of the old bridge, lower it and move it 4 ft. longitudinally. The skew of the abutments made it impossible to place the cranes where they could set the girder directly to place without longitudinal shift.

The girder was picked up by pairs of simple girder hooks engaging the top flange angles near either end, which, though putting 50 tons pull on the upper flange at each point, did no damage. When swung over the side of the old bridge the girder was simultaneously lowered and shifted longitudinally by booming up on one


1 L, 8" x 6" x 1/2"
2 Ls, 4" x 4" x 3/8"
5'-4"
6'-6"
3'-6"
1/2" Bent Pl.
5/8" Pl.
3/4" Hook Bolt
3/4" "A" Bolt
4 Ls, 6" x 6" x 5/8"
2 Cov. Pls. 14" x 1/2"
1 Web Pl. 37" x 5/8"
4 Ls, 6" x 6" x 9/16"
1 Web, 37" x 9/16"
10' b. to b. Ls
Spl. Pls 8" x 3/8"
Pls 16 1/4" x 3/8"
Pls 25" x 3/8"
6" Pin
3'
C.L. Main Girder
15'-5 7/8"
3/8" Pl
4 Ls, 3 1/2" x 3" x 3/8"
Laced 2 1/2" x 5/16"
12'-10 1/8"
2 Ls, 3 1/2" x 3" x 3/8"
2 Ls, 3 1/2" x 3" x 3/8"
2, 15" @ 45 lb.
1, 12" @ 32 lb.
Cross - Section

CROSS-SECTION OF NEW BRIDGE—PIN JOINT IN FLOOR-BEAM

of the cranes and booming down on the other. When landed on the end shoes the turned anchor bolts went in easily, showing that the 3-ton shoes had been placed very precisely as to longitudinal spacing. The track was out of service for a little less than two hours.

The bridge was designed in the office of H. T. Welty, engineer of structures, New York Central R.R. R. E. Dougherty, district engineer, directed the erection for the railroad, and Louis Chevalier, chief engineer of the Stillman-Delehanty-Ferris Co., contractor for the steel erection, was in charge for the contractor. The entire work was under the general supervision of J. W. Pfau, engineer of construction, and G. W. Kittredge, chief engineer, New York Central R.R.

## What Are the Limitations of Wood Pipe Under Fills?

### Failure Under 10-Foot Backfill Emphasizes Need for Careful Soil Examination Before Specifying Pipe Strength

A THIRTY-SIX-INCH wood-stave pipe recently collapsed under a 10-ft fill—an unusual occurrence, but worthy of examination in order that other accidents from similar causes may be avoided. The collapse occurred simply because unusual conditions put a loading upon the pipe greater than it was designed to withstand.

The pipe was 36 in. in diameter, with 1⅝-in. redwood staves held in place by ½-in. iron bands, 12 in. apart, except at joints where the spacing was 6 in. The depth of the trench in which the pipe was laid ranged from 10 to 15 ft., with an average of about 13 ft., so that the average depth of backfill above the top of the pipe was about 10 ft. The bottom of the trench was about 5½ ft. in width. In the service for which the pipe was laid there would be no internal pressure, whereas wood-stave pipe is commonly used for pressure lines.

Because of the rapid seepage of ground water into the trench, pumps had to be used continually during construction. The use of the pumps was discontinued of course when backfilling commenced, and the water level then immediately rose to the normal level, 5 or 6 ft. above the top of the pipe. After placing the backfill in several hundred feet of the trench it was found that the pipe had collapsed.

A section of the pipe laid in trench but not backfilled was then selected as a trial section, and determined efforts were made to complete the work as originally planned. The bands were cinched up carefully and uniformly and as tightly as possible, and the backfill was tamped very thoroughly around the pipe. Even under these conditions, however, when the fill had reached a depth of 4 or 5 ft. above the top the horizontal diameter had increased 1 to 1½ in. and complete failure appeared to be certain if the fill were continued.

The manufacturers of the pipe made shop experiments, using staves 2½ in. thick, as a result of which it was found that even with 2½-in. staves the pipe would not have had enough strength to support the weight brought upon it by the backfill under the conditions that obtained where the failure occurred.

Along this section of the line the top four or five feet of the soil are a heavy blue or black clay or adobe, apparently containing considerable organic material. Below this there is a very fine-grained sandy or silty clay. This is very hard and compact in place but when loosened and pulverized in water it loses all cohesion and becomes liquid.

An independent engineer, called in to report upon the pipe failure, said: "The manner in which the clay used for backfill decomposes in water might leave the extremities of the horizontal diameter of the pipe with little lateral support. The observed lengthening of the horizontal diameter of the pipe would seem to verfy this theoretical deduction. Without lateral support the wood staves can furnish very little resistance to external vertical loads. If ordinary dry material, or material which would compact by tamping, were available for backfill, it would furnish the necessary lateral support. Lacking this, the sides of the pipe must either be in close contact with the walls of the trench, or the intervening space must be filled with some unyielding material. If the sides were thus supported, the wood staves would form an arch capable of sustaining, a portion of the backfill. If the staves were thick enough they would support the entire fill. Otherwise, the balance of the fill must be supported by some other form of construction."

The engineer also included in his report an opinion to the effect that "where the sides of redwood pipe can be held firmly in place so that the horizontal diameter cannot increase, then 1½-in. redwood staves are capable of safely supporting under the most severe assumed condition of loading a mud fill slightly more than 2 ft. in depth over the top of the pipe. If the staves are 2½ in. in thickness this depth of fill can be safely increased to about 6 feet."

#### Method of Repair Adopted

In the section of the trench in which the pipe had already been constructed, but on which the backfill had not yet been placed, the trench was backfilled to the level of the pipe center with concrete and a reinforced-concrete arch 4 in. in thickness at the crown was constructed over the pipe. In order that the concrete should not be affected by swelling of the pipe which might take place during setting of the cement, the concrete was placed in layers and a wedge-shaped key at the crown of the arch was poured after the balance of the arch had secured an initial set. No backfill was permitted for two weeks after the last concrete was poured. Meantime, the trench was allowed to fill with water to the ground level, the backfill finally being made in water. Concrete reinforcing was used on about 700 ft. of the 36-in. pipe.

### Lumber Production Less Than Last Year

For the year that ended Oct. 31 the 713 mills reporting to the National Lumber Manufacturers' Association cut 15,573,900,000 ft. of lumber and shipped 2½% more than the production. For the 10-month period that ended the same time the production was 4% less than during the same period in 1916, but shipments were 5% more. During October 1,417,700,000 ft. were cut, 5% less than in the same month last year. Shipments were 1,234,800,000 ft., 7% less than in October, 1916.

# Kankakee River Is Improved for Drainage of Marshes

## Channel Straightened and Deepened Will Reclaim Large Area—Dipper-Dredge Excavation Employed

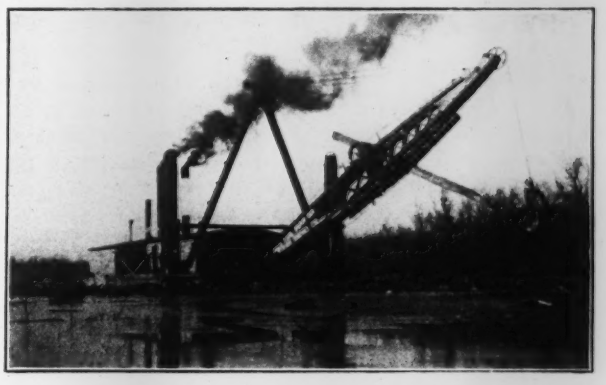
TWENTY-EIGHT miles of the Kankakee River in Indiana are being improved to facilitate the drainage of swamp and overflow lands. The improvement extends from the west line of Starke County southwest to within seven miles of the Indiana-Illinois state line. At a cost of about $310,000 this will reclaim a large area of swamp or marsh land which will be valuable for truck farms and general farming purposes. The river channel, improved ten years ago to the starting point of the present work, is known in the court records as the Marble ditch.

The new work includes the straightening and deepening of the river by a channel which has a bottom width of 70 ft. for 16 miles and 100 ft. for the last 12 miles. The increase in width is made at the outlets of tributary streams. The average depth, including the portions which cross and follow the old channel, is 10 ft. The banks have a slope of 1:1. The grade is 0.02%, which gives a velocity of about 3 ft. per sec. The capacity of the channel will be about 2400 sec.-ft. at the upper end and 3370 sec.-ft. at the lower end.

The soil is mainly a black sandy loam, but in some cases it is almost entirely sand. The first three miles are in clay, but further down there is sandy subsoil with some layers of clay. The completed (upper) part of the channel maintains itself in good condition, and there is no tendency to filling of the channel or caving of the banks. Along this part of the work, therefore, land that was formerly overflowed is now farmed. The channel is crossed by four railways and five public highways. These have plate-girder bridges 120 ft. long, on concrete piers and abutments. Provision is made for lifting the spans to allow dredges to pass for future cleaning of the channel.

This is a dipper-dredge job and the contractors are operating three machines. A dredge with 1½-yd. bucket is used to excavate the laterals or small tributaries. It also works ahead of the large dredge, partially excavating the cut along the sides of the channel. This leaves a portion in the center which a dredge with a 3½-yd. dipper finishes to the specified grade. This dredge is shown in the picture printed herewith. A third dredge, with a 3-yd. dipper was placed in construction at about Mile 14. This machine partly constructs the channel to a depth of about 8 ft. and leaves the bottom to be leveled and finished by the large machine.

The smaller machines have short booms and can work more rapidly than the large machine. They are used to excavate the short-haul work. The largest machine,



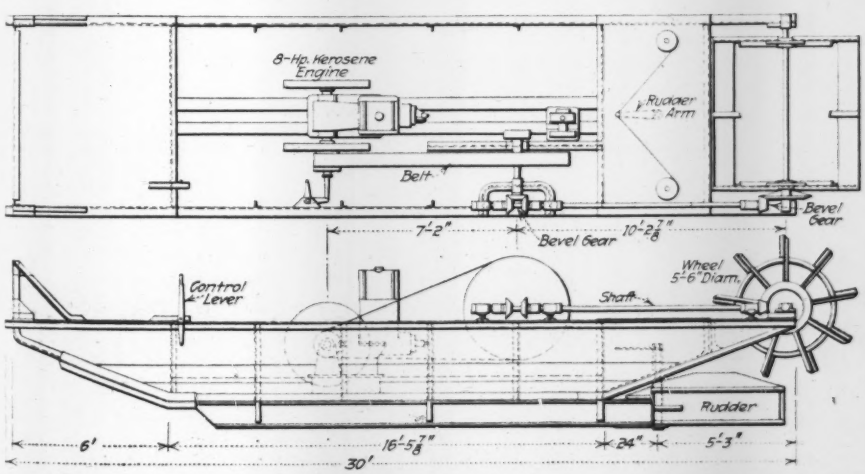
A 3½-YARD DIPPER DREDGE IS USED ON THE KANKAKEE RIVER

which has a hull 110 x 46 ft., carries its 3½-yd. bucket on a 90-ft. boom, so that it can operate from the center and place material over the spoil bank made by the other machines. However, it is not possible for this dredge to complete the entire work of each section without moving from one side to the other as it works downstream. This machine averages about 60,000 yd. per month. The total excavation is more than 5,000,000 cubic yards.

Coal supply for the dredges is provided under favorable conditions, as railways cross the work at frequent intervals. On the greater part of the work it has been possible to dump the coal from cars on the trestle over the ditch directly into the barges, which are hauled to the dredges by small gasoline towboats shown in the drawing.

The boats have 8-hp. kerosene engine belted to bevel gears for driving the wheels in either direction. Longitudinal shafts from this gearing carry bevel pinions which engaged larger bevel gears on the wheel shafts. The ends of the hulls are inclined, and at the sterns large rudders are fitted beneath and in front of the paddle wheels.

It is estimated that the total cost of unloading and handling coal by means of this boat is 75c. per ton. This in-




STERN-WHEEL OIL-ENGINE TUG HAULS SUPPLIES ON DRAINAGE DITCH CONTRACTS

cludes the hauling of a small portion of the coal by teams. The contractors are R. H. & G. A. McWilliams, Chicago. The bridges will be built by the county. The work is under the direction of Clifton J. Hobbs, of Rensselaer, Ind., who is drainage commissioner of Jasper County and also superintendent of construction of the Kankakee River improvement in Indiana.

## Awakening Recognition of the Engineer

### A Canadian View Which Accords with Progressive Thought on This Side of the International Line

"HERE we are, a powerful legion with all the potential attributes of mind, heart and soul to carry us to undreamed heights of eminence, and how far we shall rise as a profession is only limited by the minimum amount of effort which each and every one of us is prepared to give in conjunction with his fellows to make what is reasonably possible a living reality."

With these words, Fraser S. Keith, secretary of the Canadian Society of Civil Engineers, closed a review of the status and future of the engineering profession in an address recently before the Ottawa branch of the society. He stated briefly the recommendations of a report which will democratize the society, placed emphasis on the need of greater service to the individual and maintained that increased recognition and remuneration were within easy grasp if the members of the profession coöperated.

Extracts from his address follow:

At the last meeting of the Council, held on Oct. 30, the report of the committee on society affairs was accepted and approved. . . . The distinctive feature of this report is the increased sense of responsibility of our society, which means the profession, in its relation to the individual member, and of greater importance still, in its relation to its service to the public at large. We have, therefore, apparently reached a point where we know that our former objects were limited and our activities circumscribed, and it is now possible, with that knowledge, to go further, believing that the future of the profession lies largely in how far it is willing to assist the individual member and to what extent he may coöperate with the profession in dealing with all public matters, whereby our interests are affected, using this newly awakened sense in making our combined influence felt outside of the society. It would then appear that (and let me emphasize) *the awakening of the engineering profession involves, in the first instance, the increased recognition of the profession's responsibility to the individual, and the individual's responsibility to the profession, and in the second place their collective responsibility to the public, and in turn an acknowledgment from the public of the engineer's real place in national affairs, which includes status, remuneration and opportunity of service.*

We have been criticized in the past, not only because we were accused of being narrow in our objects, but also it was stated we were collectively without a soul or heart. Be that as it may, if the heart of the profession were a composite heart of the individuals therein it would leave nothing to be desired, but, we must admit there has been some coldness and to some extent indifference, and we should therefore to the greatest possible extent cultivate a fraternal spirit that will develop a heart in our organization, a pulsating, personal heart throbbing with human emotions, and cause that heart to beat warmly and sympathetically not only for our own members, but in our relations with the outside world.

#### Public Questions

It is possible for a branch to include in its discussions public matters of local interest, even where the branch is not directly concerned. In fact, as a profession we will make greater strides if we give fuller discussion to public questions and less to technical subjects than we have in the past. The branch should be more than a mere unit of the local members of the profession. It should be a fraternal organization meeting in a spirit of good-fellowship. It should encourage the younger members in every way and give them an opportunity of learning public speaking, as well as absorbing the ideas of the older men in the profession. It should be ever and always on the lookout for opportunities for service. The branch should be the technical centre in any community and could possibly take an active part in the technical education of the district, or at least give advice thereon.

The proposed changes in the by-laws, as well as the change in name, will to some extent increase the prestige and standing of our various branches. Each branch will elect its own councilors and will consequently be more directly represented at the headquarters of the society than at present. It is intended to hold an annual meeting of the society once a year in every province. This meeting will be directed by council, will have representatives present from headquarters, and the official report of the meeting will be published in the annual report. These changes are based on the admitted necessity of greater fraternity and closer coöperation, and will enable the individual member to come to a better appreciation of his fellow members, together with a personal responsibility to the society and to the profession. The object of our organization in the future will be of a broad enough nature to enable the society both at headquarters and from its branches to engage in useful public service.

#### Remuneration

Some of you may have asked yourselves the question, where does all this lead to and how does it affect our earning capacity? Two definite factors in increased earning capacity are—additional usefulness and added recognition. . . . Let me ask you, what position would the government of Canada be in to-day in carrying out the nation's work without the services of the men in the engineering profession. The majority of the departments of the government would be unable to operate without our help. Do the political members of the government realize that this is true? It is certain that they do not. Why? Because we of the engineering profession have in the past taken no corporate action to insure that they should. Instead we have to some

extent acted like dumb driven creatures, accepting the crumbs that have fallen by the wayside, content to sell superior qualities of mind and training for a mess of pottage; for despite your capacity, such in general is your reward in comparison with your true worth. As individuals, it may not be possible to force the recognition needed, but as a body we are a mighty power capable of securing any reward within reason upon which we set our minds and hearts. It is not only in the government service that engineers receive inadequate reward, but throughout the entire profession, and particularly those employed at railway work.

There is one active full member of our society who is a resident engineer on one of the transcontinent railways and his salary is $100 a month. He has a wife and family. Whose fault is it that such is true? Yours and mine. How much longer is the engineering profession going to continue to be underpaid? Just as long as we permit it, gentlemen, and no longer. We have it in our hands to bring about a different state of affairs, but action is required, not words. We have talked in the past a great deal about inadequate rewards and we may continue to talk, but nothing will be accomplished until we secure a higher standard of reward, and we shall find the accomplishment so easy that the wonder will be why we had not thought of doing so sooner. We are to-day exactly in the position of the man staying out all night on his own doorstep because he thought he could not get in, only to find out in the morning that he had the key in his pocket.

The government and railway officials and the general public have only a vague conception of what they owe to the engineering profession for their material welfare, and they will continue in ignorance until we have educated them. In the meantime, gentlemen, it is we who are culpable, not they.

### Recognition

The newspapers in this country are the great moulders of public opinion, and it is to them we must look, to some extent at least, for coöperation and assistance. For, once we have convinced the editors that in doing this they are assisting in the public weal, the natural patriotism that characterizes the editorial body would prompt them to act and give their hearty support.

The lawyer and the politician have admittedly failed to solve the industrial relations of man to man and the relations between capital and labor. The very qualifications of mind and training that have enabled the engineer to so successfully grasp and solve any problem set before him will be called upon and required to solve and to deal with what will be, after the war, the greatest problem which we have to face.

We find already many of the executives of large industrial concerns being chosen from our own profession and more and more will the men who have received a thorough training in technical matters be called to the high positions in industrial affairs. This will mean the opening up of a scope for the profession, giving rise to a future that will place the technical man in control of the industrial life of the nation. Coincident with that is arriving a condition whereby the engineer must, besides drawing plans and specifications, give his advice in connection with financing of any industrial or engineering undertaking, so that the time is coming, and very soon, that the engineer instead of receiving the reward that capital is willing to offer will walk hand in hand with the capitalist, on an equal footing, and will share in the rewards that the other has heretofore enjoyed.

In view of such enticing prospects and possibilities for the individual, what limit is there to our development as a profession by acting in unison? Here we are, a powerful legion with all the potential attributes of mind, heart and soul to carry us to undreamed-of heights of eminence, and how far we shall rise as a profession is only limited by the minimum amount of effort which each and every one of us is prepared to give in conjunction with his fellows to make what is reasonably possible a living reality.

## Panama Canal Slides Under Control

THE present status of the notorious Culebra slides on the Panama Canal is noted as follows in the annual report for the fiscal year 1916-17, by Governor Chester Harding of the Canal:

"An important part of the work of the dredging division has again been the removal of material from the sliding areas in the Culebra section of Gaillard Cut. Aside from the fact that during the year there was an easily navigable channel available, with but two interruptions of a total of 10 days, as compared with the entire closure of the canal from October, 1915, to Apr. 15, 1916, perhaps the best indication of the improved condition is that the removal of 6,834,072 cu.yd. from the Culebra slides during the year has resulted in a prism of full depth and the full width of 300 ft. throughout, with increased widths of from 200 to 500 ft. at the points of former maximum activity. During the year ended June 30, 1916, 11,210,141 cu.yd. were removed from the same section of the canal. In July, 1916, 1,073,675 cu.yd. were removed, and in June, 1917, 341,568 cu.yd. The West Culebra slide has been quiescent throughout the year, the volume between the peripheral break and the canal having settled to such an extent as to give indications of having reached a condition of stability.

### East Culebra Slide Still Moves

"The East Culebra slide is still in motion, with occasional periods of increased activity and intervals of comparative rest. Each active period results in a settlement of the entire mass within the limiting break and a horizontal motion toward the center of the bowl-shaped area. Since the dredges have succeeded in excavating the east bank several hundred feet outside of the limits of the canal prism, recent movements of the mass have no longer produced upheaval of the bottom within the prism, or shoals within the canal by the flow of material from the bank, and after every movement the dredges, working outside the limits of the prism, have had no difficulty in excavating the material before it reached the channel. The ultimate condition of stability will evidently be reached when the broken mass has settled to a surface not far from horizontal with a nearly vertical bluff at the limiting break.

"All told, 23,259,909 cu.yd. of material have been re-

moved by dredges from the Culebra slides (east and west), and it is estimated that 3,600,000 cu.yd. yet in motion will have to be removed. The points established last year, at the request of the Chairman of the Slide Committee of the National Academy of Sciences, on Gold, Zion, Contractors, and Purple Hills and at the bases of Gold and Contractors Hills, have been checked from time to time. No indication of movement of the points has been detected. Extension of the peripheral breaks of the east bank have occurred, so as to increase the area of the east slide by 3 acres. The amount of material involved in these extensions is relatively insignificant, and on account of the distance from the canal it is improbable that any of it will reach the prism.

"Cucaracha slide has given no further trouble since the large movement that blocked the canal in August, 1916. To reduce the chances of interruptions to traffic due to future similar movements if they occur, the material in the slide was removed for a distance of 100 ft. outside the canal prism.

"It is believed that in the future the great slides of the canal will be of historic interest only."

### Purchasing Officers for the Government

A list of officers making purchases for the Army and Navy and the United States Shipping Board has been received by the Bureau of Foreign and Domestic Commerce and may be consulted at its district offices.

## Derrick Wrecks Concrete Building with Heavy Ball

**Roof and Floors Shattered Successively—Fire and Torches Help in Breaking Columns—Fire Tried Also on Floors**

A DROP weight, acetylene torches, fire and chains were the principal means employed in wrecking the eight-story reinforced-concrete Western Newspaper Union Building, in Chicago, to clear the site for the new Union Station. Prior to the destruction loading tests were made on one of the flat-slab floors, as described in *Engineering News-Record* of Sept. 27, p. 597.

Designed for floor loads of 300 lb. and 250 lb. per sq.ft., the building was of heavy construction and heavily reinforced. The flat-slab type of floor was used for the lighter load and beam-and-girder type for the heavier load. The building was erected in 1909-10.

Smashing the concrete by dropping an 1800-lb. cast-iron weight upon the floor slabs and girders was the principal method employed. For this purpose an electrically operated stiff-leg derrick with 20-ft. mast and 40-ft. boom was employed. This gave a 30-ft. vertical drop. The cable overhauled the drum, and was not detached from the drop. The ball or weight was somewhat pear shaped, and with a rounded bottom. On the roof and then on each floor in succession the derrick was

THIS DERRICK WITH DROP WEIGHT SMASHES HEAVY CONCRETE FLOORS

REINFORCED-CONCRETE COLUMNS AND GIRDERS ARE PULLED OVER ON THE FLOOR, WHERE RODS ARE CUT AND CONCRETE IS BROKEN UP

moved along the rollers until it had covered the entire area. It was then lowered to the floor below by means of an inclined skidway.

Repeated blows shattered the concrete slabs, so that the pieces fell through the network of reinforcing steel. A gang of about 40 men broke up the larger pieces with sledges. They also pulled out the steel bars and threw them into an adjacent lot which had been already cleared. The débris was hauled by a slip scraper to a chute near the middle of the building, delivering it to a bin from which it was discharged into motor trucks standing on the first floor.

Girders and beams were broken up in the same way. In some cases the girders fell in large masses but remained suspended by the steel reinforcing bars, which were then cut by acetylene torches. Interior columns were broken partly by dropping the ball on their heads. Wood fires at their bases were used to heat the concrete, which cracked and spalled when water was thrown upon it by a hose. The exposed vertical rods were then cut with torches and the columns and girders were pulled over. With these small open-air fires the heating and chilling of the concrete had no great effect, but it sufficed to expose the rods.

Exterior columns could not be broken by the drop weight, as this would have resulted in throwing material into the street. The concrete at the base was partly broken away with sledges, and some of the bars were cut with torches. Chains were hooked around the column heads and the spandrel girders, and attached to the cable of the derrick standing on the floor level with the base of the columns. In this way the columns and girders were pulled over upon the floor, where the remaining rods could be cut and the concrete broken up conveniently.

Disintegration or softening of the floor concrete by oil and fire was tried. Oil was poured over it and a fire then lighted on the slab. The penetration of the oil was so slight that this method assisted the drop weight only to a small extent, and it was found that the results did not justify the extra time and expense. Wrecking the floors by an upward pull was suggested, but it would have been difficult to get a rig suitable for pulling. Derricks are not adapted for such stresses, and in fact the boom of the derrick used on this work was broken when an attempt was made to tear out some of the reinforcing steel.

Removal of window sash and frames, piping and other fixtures preceded the wrecking. The demolishing of the structure was commenced in August, with the derrick mounted on the roof. It will be completed before the end of year. The W. J. Newman Co., Chicago, has the contract for this heavy wrecking job. All work is under Thomas Rodd, chief engineer of the Chicago Union Station Co., J. D'Esposito is assistant chief engineer and A. J. Hammond is principal assistant engineer.

## City Management Does Not Mean Municipal Ownership

### H. M. Waite, City Manager, Dayton, Lays Down Reasons for Coöperation Between Utilities and Municipalities

COÖPERATION between cities and utilities will solve the difficulties the former have in getting service, and the latter in making a living, according to H. M. Waite, city manager of Dayton, Ohio, who discussed the subject at the recent convention of the City Managers' Association at Detroit. His remarks are abstracted below:

Undoubtedly many have got the idea that city management means municipal ownership. There is just one thing in which communities are interested jointly with utilities, and that is service. By this I mean, broadly, everything that service implies, gives and requires—proper service to the community and a fair return to the utility on a fair valuation. Public ownership of utilities is a long way off, though ultimately it may be the answer. Our municipal governments are too uncertain yet to think seriously of municipal ownership.

Cities all over the United States are spending a great deal of money in laying out a program for everything but utility service. Money is being spent on sewers, water and streets, but how many cities are spending money on future service from their utilities? If your utilities have not a sufficient return to give service the community suffers. If your transportation utilities cannot automatically expand to meet the transportation of your community, your community suffers.

Financially, today the utilities are struggling. It isn't a question of war times—their securities started to shrink long before the war began. What is the trouble? Too often there is not enough coöperation between the municipality and the utility. There seems to be a feeling of antagonism toward public utilities. Is it because the utility is not giving the service that the public demands, or thinks it needs? Does the public know what service it does need? Those two questions demand investigation. As long as public antagonism exists there is a corresponding shrinkage of securities, and naturally there follows a shrinkage in the service rendered by the utility. Everything points to the necessity of coöperation between the utility and the people.

Having followed this line of thought in Dayton we went to the transportation utilities and asked: "Where

are you heading?" They did not know. The operating man has no time to think about the future of his property 10 to 20 years hence, but he knows that he is being pinched now. The city employed a man to go over the properties and make a preliminary report as to where they were heading.

You never can get coöperative feeling between the public and the utilities with the indeterminate franchise. You cannot interest the public in any utility if the public has not a direct interest in that utility. I believe we shall see, and that very quickly, an abandonment of the indeterminate franchise, giving to the public a direct benefit by making possible a liberal, fair program of expansion to meet the requirement of service.

If your utilities cannot expand automatically, freely, fairly and economically, to meet the demands of your community, then your community will suffer. Therefore, I believe in comprehensive agreements between cities and utilities, based on thorough local investigations. I also believe in a determinate franchise, with a fair valuation of the property, with fair fluctuations in the cost of service to meet the changing requirements of the time, and with a payment to the city of all over a certain fair return on a fair valuation.

## Exhibit Board Educates Students in Current News

### Substantial, Expensive Construction Made Part of Building to Impress Observers with Importance of Subjects

INTEREST in current events in the engineering world is fostered among the engineering students at Northwestern University, Evanston, Ill., by means of an elaborate, permanent exhibition board. Since some engineering societies have under consideration the exhibition of photographs, maps and other material illustrating enginering topics of the day, a description is given of this board, which has created among the students a desire to keep up with the times.

It has been the policy at Northwestern to have one central educational idea around which the exhibit centered, but in each case one or two panels were taken up with a special exhibit calling attention to particular engineers and engineering achievements having special "news value." This part of the exhibit is changed more often than the remainder.

Recently the main exhibit was on the National Bureau of Standards, the central panel containing a large blueprint of announcement and having on either side photographs of the buildings, testing machines and specimens. All are properly labeled with well-written paragraphs designed to give enough information to tell what the pictures are about. Something is left to the imagination, with the idea of leading the observer to investigate the subject further.

Some of the educational exhibits are as follows: Great bridges; severe survey conditions and general information about Chicago weather; electrical development in power plants; wireless telegraphy and remote control; uses of terra cotta; automobile construction; landslides at Panama; work of the U. S. Coast and Geodetic Survey.

On the single board which the students call "Engineers and their stunts" have been shown photographs of the builders of the Catskill Aqueduct and of the Que-

ENGINEERING NEWS OF DAY SHOWN ON SUBSTANTIAL BOARD

bec Bridge, with short extracts from recent articles of appreciation in *Engineering News-Record.*

In design, the idea was to make the board appear as a part of the building. It is situated on the second floor, where virtually all students must pass it frequently. A 25-ft. stretch of wall was available, and the height was selected so that the eye of the average person would come near the center of the 4-ft. panel and ordinary type could be read at the top. The 4-ft. width was chosen so as to obtain plenty of room for large maps. The doors of the panels are ¼-in. plate glass set in pressed-steel hinged frames.

The wood framework is of oak veneer, to harmonize with the trim of the building, 9 in. wide and 2¼ in. thick. At the back is a sheet of soft cork-board into which thumb tacks press easily. To permit the exhibition of books the space between the glass and board in the two central panels is 1⅝ in. In the others it is 1 in. The whole frame is permanently anchored by bolts to the wall. The entire cost was about two hundred dollars.

The exhibition board was suggested by John F. Hayford, director of the College of Engineering, and the design and execution were carried out by the architects for the university.

# LETTERS TO THE EDITOR

*Comment on Matters of Interest to Engineers and Contractors Will Be Welcome*

## Should Engineering Students Be Drafted?

Sir—In reply to the inquiry of Dr. Palmer C. Ricketts, president of the Rensselaer Polytechnic Institute, as to the wisdom of drafting students of engineering schools, I beg to give as my opinion that it is wrong to do so. It is wrong because all of those of military age and red blood have volunteered, and those that have not would be useless if drafted. F. J. MACISAAC,

Smith, Hauser & MacIsaac, Inc., Contractors.

New York.

## Are Values for Nailed Joints Too High?

Sir—The writer has read with interest the article "Tests on Nailed Joints in Fir and Hemlock Timber," published in *Engineering News-Record,* Nov. 8, 1917, p. 871. Outside of one other set of tests (*Engineering Record,* Jan. 13) the tests of the Bureau of Buildings of Portland comprise the only published record on the lateral strength of wire nails in conjunction with Douglas fir.

The writer has made a careful study of a number of tests on nailed joints [Mr. Dewell notes particularly the items Nos. 5 to 9 in the appended bibliography of tests. —Ed.] The results of his investigations from these data are embodied in his book "Timber Framing." Without having recourse to direct tests on Douglas fir he has considered that for all practical purposes the lateral strength of nails in yellow pine and Douglas fir may be regarded as equal, and he has proposed that the safe working strength for a wire nail in either of these timbers, when such nails are driven normal to the fibers of the timber, may be expressed by the formula $S = 4000\ d^2$, where $S$ = safe lateral resistance of one nail in pounds; $d$, diameter of nail in inches.

This formula is given after study of all the tests made, the values for the different timbers, as white pine, Norway pine, oak, yellow pine, etc., being considered in accordance with their physical properties, and special attention being paid to the elastic limits.

The statement made in your article that Professor Hatt suggests that the safe resistance of a nail for resisting lateral forces be taken as 9.6 times the pennyweight of the nail is hardly correct, nor is the line "Safe loads suggested by Hatt" in your figure in accordance with Professor Hatt's recommendation. Professor Hatt advises the formula $S = 9.5\ D$, where $S$ = safe lateral resistance in pounds of one nail in yellow pine, and $D$, pennyweight of the nail; but he states that this formula should be taken only for nails up to and including 20d nails. For nails above this size, the formula will give too high values. Furthermore, the values given by the foregoing formula represent a safety factor of five on the ultimate strength of the joint, and a safety factor of three on the elastic limit of the joint, for the tests under discussion, that is, those of Darrow and Buchannan.

It appears that the recommended working values of the Portland Building Department are about a mean between those values representing a safety factor of three on the ultimate strength of their tests and the safe values according to Professor Hatt's formula, erroneously applied, and the writer believes that virtually all these recommended values are higher than is warranted.

In the table given herewith, there is presented the ultimate strength of one nail in "single shear" in a timber joint of yellow pine or Douglas fir, for the various sizes of wire nails, as determined by previous tests. The table also gives the average of all these results for each size nail, and the safe working strength as determined by the writer's formula, $S = 4000d^2$, with the corresponding safety factor in the average ultimate strength shown by all the tests.

The results of these various tests differ widely. This variation is due largely to the differences in strength in the timber blocks used, as different specimens of the same kind of timber will show different compressive strengths, due to moisture conditions, density, etc. It will be realized that the factor of density must exercise a considerable influence on the strength of a nailed joint in many instances, due to the large proportion that the thickness of the annular rings bears to the diameter of nail. The strength of such nailed joints is a function of the bending strength of the nail, and also, in every case, a function of the compressive strength of the timber, both in end bearing and bearing across the fibers.

The tests of Walker and Cross, since made on Norway pine, are not directly comparable with the later tests on yellow pine and Douglas fir. The numerical values for the ultimate strengths were low as compared with those found by the other tests. It was found that the strength of the nails at the elastic limit followed with

remarkable closeness the formula $Se = 5500d^2$. This series of tests comprised some 300 joints.

Your article states that an effort was made to determine the elastic limit of the joints, but this could not be established. The tests of Walker and Cross, Darrow and Buchannan, Morgan and Marish found, according to the published reports, that the elastic limit of the joints occurred at a load of about 60% of the ultimate load, and at a slip of the joint of approximately $\frac{1}{16}$ in. Wilson, in the Forest Service tests, states that the elastic limit was well defined, and occurred at a comparatively small deformation, namely, with a slip of from 0.018 to 0.039 in. and at a load of from one-third to one-half the ultimate load.

In this connection the writer would remark that in all these tests, with the single exception of the Forest Service tests, the methods adopted in measuring the slips were apparently quite rough. In at least two of the series of tests, the slip of the joint was noted only for $\frac{1}{16}$-in. deformations, and was measured on one side of the joint alone. This rough method cannot be expected to give the true value of the slip of the joint, and any load-slip curve plotted from such results will very probably give an uneven or angular curve. The writer's experience in testing timber joints has been that whenever the true deformation of the center of the joint is determined, the resulting load-slip curve is remarkably smooth.

With regard to the elastic limit, a full description of all such tests should define what is meant by the elastic limit, that is, whether that point is meant at which no permanent set in the joint occurs, or whether the elastic limit is used in place of the better term yield-point. In the case of timber joints, the writer believes that this latter point is best determined, by the method of the late Prof. J. B. Johnson, as that point on the load deformation curve at which the tangent to the curve has 3/2 the inclination of the tangent at the origin of the curve. Furthermore, the writer believes that this point should always be determined, and the working values should always be based on corresponding loads.

In conclusion, the writer believes that the working values as established by the Portland Building Department are too high for general use in a building ordinance. The engineer will usually use his own judgment in such matters, based on the published data of tests. On the other hand, the average architect generally belives that all working values established by engineers carry a safety factor of from four to five, and designs accordingly. In addition, such considerations as impact, or relation of probable live load to actual dead load, seldom enter his head. Consequently, it is the writer's opinion that any values established for a building ordinance should be conservative rather than high.

San Francisco. H. D. DEWELL.

[In justification of the Building Department of the City of Portland it should be stated that its report did not contain the curve ascribed to Professor Hatt. That was added in the office of *Engineering News-Record* and was extended, as Mr. Dewell points out, beyond the limits intended by its originator. The original report, which is quite extensive, contained a considerable discussion on the elastic limit, which was not included in the abstract in this journal.

There is appended herewith a bibliography of the subject made up from references gathered by the Portland department and by Mr. Dewell.—Editor.]

BIBLIOGRAPHY OF TESTS OF HOLDING POWER OF NAILS

(1) "Tests of Metal," 1884. Tests of the adhesive resistance of nails in timber, made at the Watertown Arsenal on white pine, yellow pine, white oak and chestnut.

(2) *Engineering News*, Jan. 11, 1894. "Experiments to Determine the Holding Power of Nails and Drift Bolts," by F. W. Clay. Red oak.

(3) Transactions of the American Society of Mechanical Engineers. Vol. 16, 1895. By W. E. Barnes and R. G. Stillwell, to determine work required for driving and pulling out nails. Recorded by R. C. Carpenter. Southern pine.

(4) Association of Engineering Societies, February, 1896. Experiments made by Frank Soulé on the resistance offered by nails to pulling from Douglas fir and redwood.

(5) Association of Engineering Societies, December, 1897. Tests of the lateral resistance of nails in Norway white pine and oak, by F. B. Walker and C. H. Cross.

(6) Proceedings of the Indiana Engineering Society, 1900. Tests by H. D. Darrow and D. W. Buchannan at Purdue University in 1898. Described by Prof. W. K. Hatt. Yellow pine and oak.

(7) Bulletin No. 2, Vol. IV of the Experiment Station of Iowa State College. Tests by C. K. Morgan and F. Marish at Iowa State College in 1907. Described by M. I. Evinger. Nails ranging from 8d to 60d and lumber white pine, yellow pine, spruce, fir and oak.

(8) *Engineering Record*, Jan. 13, 1917. Test by J. C. Stevens on Douglas fir.

(9) *Engineering Record*, Feb. 24, 1917. Tests by the Forest Service at Madison, Wis., described by T. R. C. Wilson. Yellow pine.

ULTIMATE STRENGTH OF ONE NAIL IN "SINGLE SHEAR," AS DETERMINED BY VARIOUS EXPERIMENTERS, FOR YELLOW PINE OR DOUGLAS FIR

| (1) Size of Nail in Penny-weight | (2) Darrow and Buchannan | (3) Morgan and Marish | (4) Forest Service Wilson | (5) Bureau of Buildings Portland | (6) Average Ultimate Strength | (7) Working Values According to Formula $S = 4{,}000d^2$ | (8) Safety Factor on Av. Ult. Strength Col. 6 |
|---|---|---|---|---|---|---|---|
| 6 | 240 | | | | 240 | 53 | 4 5 |
| 8 | 361 | 294 | | | 328 | 62 | 5 3 |
| 10 | 724 | 324 | | 525 | 524 | 88 | 5 9 |
| 12 | | 625 | | | 625 | 88 | 7 2 |
| 16 | 855 | 494 | | 600 | 650 | 110 | 5 9 |
| 20 | 930 | 746 | 779 | 749 | 808 | 165 | 4 9 |
| 30 | | 1,221 | 783 | 922 | 926 | 194 | 4 8 |
| 40 | 1,450 | 1,067 | 845 | | | | |
| | | | 1,125 | 1,183 | 1,134 | 226 | 5 0 |
| 50 | 2,000 | 1,425 | 1,261 | | 1,575 | | 5 9 |
| | | | 1,615 | | | 268 | |
| 60 | | 1,783 | 1,144 | | 1,593 | | |
| | | | 1,644 | 800 | | 322 | 4 9 |
| 80 | | | | | | 364 | |
| Average safety factor | | | | | | | 5 4 |

## Does Waterproofed Concrete Resist Sea Water?

Sir—We have noted with considerable surprise the statement made in the article of Messrs. Wig and Ferguson on the "Selection of Materials for Sea-Water Concrete," in your issue of Oct. 18, that concrete containing our Toxement integral waterproofing compound showed the same "defects and deterioration" as structures not containing it.

We have thought we had some good evidence to the contrary, but assume that Messrs. Wig and Ferguson can back their general statement with specific instances.

New York City. TOCH BROS.

[This letter was submitted to Messrs. Wig and Ferguson who replied as follows:—Editor.]

Sir—The statement we make in reference to the use of waterproofing compounds that "the same defects and deterioration are present in the treated structures as in those untreated" is substantiated by the examination of marine concrete in which such ingredients were used.

Referring specifically to Toxement, we found three structures where this material had been mixed with the concrete. These are all in New York harbor. One of these is a reinforced-concrete pier. In this case the same cracking of beams and kneebraces has occurred as was found in many other reinforced-concrete structures along our coasts. In one of the dry docks in New York harbor Toxement was added to the concrete. Most of the concrete in the walls of this dock is covered with a brick veneer and the condition of the concrete back of the brick could not be determined. At the bow end of the dock, however, the concrete wall is exposed, as the brick facing was omitted. Here the concrete has deteriorated considerably and shows typical sea-water effect. In making repairs in 1912 to one of the quay walls at the New York Navy Yard Toxement was used in the concrete. This section is at present in very good condition, but not any better than a number of others of considerably greater age in which no waterproofing compounds were added to the concrete.

In making an investigation of the effect of waterproofing compounds on concrete the Los Angeles Harbor Department experimented with a number of compounds, among others Toxement. As far as this compound was concerned, the tests showed that it reduced the compressive strength of the concrete about 12% at the age of one month and about 40% at the age of three months.

Experiments made at the Bureau of Standards indicate that the addition of Toxement to concrete decreases not only the strength of the concrete but also decreases the density, which quality is so essential for concrete subjected to sea-water action.

RUDOLPH J. WIG,
LEWIS R. FERGUSON.

Washington, D. C.

[To this answer Toch Bros. replied as follows:—Editor.]

Sir—In the explanation by Messrs. Wig and Ferguson of their statement, the first instance cited is said to be a reinforced-concrete pier, though no name is given for identification, and it is stated that "in this case the same cracking of beams and kneebraces has occurred as was found in many other reinforced-concrete structures." Cracking of this sort in exposed beams and kneebraces occurs in many localities other than along the seacoast and is due to stress from temperature variation, and has nothing to do with imperviousness of the concrete. We do not claim that Toxement increases the tensile strength of concrete. We note that any reference to disintegration in the substructure or portion in contact with the water has been carefully omitted.

As to the statement that the exposed concrete in the dry dock in New York harbor "has deteriorated considerably and shows typical sea-water effect," we will say that we have just inspected this dock and cannot agree with the statement. The entire surface is unusually hard, smooth and sound except for a patch about one foot square which has been broken off and may or may not be due to salt water corrosion.

As to the tests in the Los Angeles harbor, we have no knowledge of any such experiment, beyond the statement made here, and have no means therefore of refuting it specifically. We can, however, refute it in general by quoting from Technologic Paper No. 3 of the Bureau of Standards which gives on p. 126 a comparison of the tensile and compressive strengths of mortars waterproofed and unwaterproofed and for a 1:6 mix; the figures are as below. The number of Toxement in these tests was 28.

| | Compressive Strength, Age in Weeks | | | | | | Tensile Strength, Age in Weeks | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 4 | 13 | 26 | 52 | 1 | 2 | 4 | 13 | 26 | 52 |
| No waterproofing | 559 | 612 | 733 | 1,056 | 1,326 | 1,673 | 96 | 115 | 183 | 207 | 248 | 259 |
| Toxement | 353 | 552 | 596 | 1,021 | 1,210 | 1,775 | 78 | 113 | 140 | 187 | 229 | 287 |

The last statement that "experiments made at the Bureau of Standards indicate that the addition of Toxement to concrete decreases not only the strength of the concrete but also the density," is apt to be misleading. In one such test two specimens of a given mix to which 2% of Toxement had been added were photographed and compared with two specimens of the same mix without Toxement. It was found in the Toxemented specimens that the stones appeared to be spaced further than in the specimens without Toxement, and in the sense that the proportion of mortar to stone was greater in the former than in the latter cases the density was decreased. This is exactly the result, however, that would have been obtained if a mix richer in cement had been used, and simply showed that hydration of the cement had been promoted and its swelling action brought into play in the Toxemented specimen. The statement, however, fails to mention the fact that the Toxemented specimens were found to be less porous than the others.

We believe that porosity is the primal cause of disintegration of concrete by sea water and that Toxement decreases this disintegration by decreasing the porosity.

New York City. TOCH BROS.

## Variations in Transit Needles

Sir—I have read with interest the communication of Mr. Newbrough in your issue of Dec. 13, p. 119, in regard to the difference in needles. Of course, the existence of such difference has been known at least from the time of Rittenhouse, but the amount given by Mr. Newbrough is in one instance much more than I have ever seen—30 in. being as much as is found except in rare instances. Those interested in the subject might turn to page 544 of *Engineering News* of June 28, 1894, and see the call down I received from the editor for venturing to suggest that such difference existed at all.

Rockland, Maine. O. H. TRIPP.

## Profiteering and Industrial Unrest

Sir—I was much interested in the editorial entitled, "Profiteering and the Industrial Unrest," in your issue of Nov. 22, and also in the one entitled, "Whither Are We Going?", in the issue of Nov. 29. These are timely discussions, and I am glad to see a journal of your standing and influence taking such advanced ground in a field too much neglected by engineers.

I have believed for some time that we have not realized the extent to which the business of the country has been subject to sinister manipulation on account of the fact that "credit power has been in private hands." In your first paragraph you point out that "tremendous changes have occurred since April in our economic and political structure." No less has public opinion changed in its attitude toward big business, as is clearly indi-

cated by this excerpt from your editorial, "It (the credit control) has been the bulwark of privilege and the undoing of those who had the vision, the organizing ability, the inventive genius, but were unable to tap credit resources." Credit is based on faith, and *control of credits* will, in the future, be as objectionable as the control of individual initiative.

In a paper recently presented to the Engineers' Club of St. Louis, I pointed out, in discussing the relation of engineers to modern business systems, that the fundamental principle of modern business is credit, which has its foundation in *confidence;* but since the prime motive in the organization of business systems is *that incomes may be secured for investors* and since the control of such organizations lies in the hands of *men who live by their incomes and who are in business solely to make money,* it appears to be a plan admirably calculated to undermine confidence and to defeat its own ends.

You do well to raise the question as to what shall be our attitude when the world conflict ceases. It appears quite probable that industrial chaos will follow the close of the war unless the great and long-suffering public insists upon coöperation with its interests by big business and the representatives of labor alike.

I commend you on the timeliness of this editorial and would urge upon all engineers careful attention to the last line of your closing paragraph, where you refer to those interesting and important questions which "engineers should have a part in answering."

E. J. McCAUSTLAND,
Dean, Faculty of Engineering, University of Missouri.
Columbia, Mo.

## Easy Method of Obtaining Squares

Sir—Referring to an article entitled "Rapid Methods for Rapid Calculations," by Mr. H. S. Jacoby, in your issue of Dec. 6, I would suggest an accurate and short method of obtaining squares, which I often use to advantage.

For instance, let the square of 48 be required. It is a simple matter to add mentally 2 to 48 and to deduct 2 from 48, which equals 50 and 46 respectively, and by multiplying the sum and difference ($46 \times 50$), and adding the square of the number which we have added and subtracted, 2, obtain the result, 2304, very rapidly.

Another example: Required, $494^2$

$$\begin{aligned} 494 + 6 &= 500 \\ 494 - 6 &= 486 \\ 486 \times 500 &= 244{,}000 \\ 6^2 &= 36 \\ & \overline{244{,}036} \end{aligned}$$

Boston. LOUIS A. HORNEL.

## Engineers and the War

Sir—In the Nov. 22 issue of *Engineering News-Record* there appeared a short but timely editorial concerning the lack of discussion by engineering societies of the industrial and engineering problems that have a direct bearing on the prosecution of the war.

As the Engineers' Society of Western Pennsylvania is not to be numbered among those not alive to the present conditions, we wish to call your attention to a paper on "Industrial Housing," presented to the Society on Nov. 13 by H. Walter Forster, general manager of the Independence Bureau, Philadelphia.

Industrial housing is considered by those familiar with the situation as one of the most pressing subjects correlated with the manufacture of Government supplies. The paper read by Mr. Forster was interesting and instructive. His statements were substantiated by statistics gathered by Government commissions in this country and Great Britain. He concluded that relief must be immediate; furthermore, that the Government and large manufacturers must take an active part in providing new and substantial houses.

The 80 concrete houses recently completed by the American Steel and Wire Co. at Donora, Penn., furnished an excellent example of work being done by the large corporation to relieve the housing shortage. On the Saturday following Mr. Forster's talk, the Engineers' Society of Western Pennsylvania conducted a trip to Donora to inspect these houses.

K. F. TRESCHOW,
Secretary, Engineers' Society of Western Pennsylvania.
Pittsburgh.

## Pinned Floorbeams Not New in Holland

Sir—In *Engineering News-Record* of Nov. 29, p. 1007, you describe briefly a flexible connection of floorbeam to truss in a bridge recently built by the Dutch State Railways.

I would like to call your attention that this is not a new type of construction, but has been in use in Holland for some years in large railway bridges, with success. This construction gives the advantage of eliminating the floor beam bending effect in the vertical truss members, which always occurs when the floorbeam connection is rigid. When, as engineer of the Holland Railroad Co., I investigated the large span over the Rhine near Rhenen, built about 1890, I could not detect any secondary stress in the vertical compression members.

The end floorbeams are always rigidly connected to the truss, in order to get a stiff end portal to bring the wind pressure from upper chord to bridge supports. A little more steel is necessary for the lower wind bracing than in the rigid connection, but the extra cost cannot be compared with the saving of steel in the vertical compression members. H. B. J. AIKEMA.
Bartlesville, Okla.

## Steam vs. Gasoline

Sir—Regarding the item, "Electric or Oil Engine for Railway," on page 1019 of your issue of Nov. 29.

Like everybody else, my company is also facing the problem of lower operating costs. We propose the use of a steam-driven motor car, in preference to gasoline, for reasons quite similar to those of old "Hook 'Er to the Biler"—— when there's steam there's power. A number of successful steam-driven automobiles are now on the market. The type of power plant used in these can be enlarged to the size of an engine capable of driving a railway car.

The steam plant is preferable because of its simplicity, dependability and uniform starting torque. The gasoline motor cars are complicated, for the engine itself must have many moving parts, and must be connected to the drive wheels through a clutch and chains

or train or gear wheels, or, in the gas-electric plant, to a dynamo, then to controller and motors; it must also have self-starter and numerous other devices. The more contraptions on a machine, the more grief for the operator, and much of this can be eliminated by the use of steam.

But granting that simplification of plant is impossible, steam is more readily adapted to starting a heavy car. The gas engine will not "take hold" of an overload, and must be going at a great rate to deliver its power at the time when that is most needed. A loaded car starts slowly. A steam engine would settle itself to the business of starting that car—no jerking or fussing, no pausing for the governor to open the mixer valve to admit more gas to make more power that should have been there in the first place to start that car, and then maybe flooding the motor down and having to try all over again.

A steam power plant would use kerosene or fuel oil with less trouble to all concerned than an internal-combustion motor.

R. F. MIRICK,
Chief Engineer, Gulf, Plainville & Northern R.R.
Great Bend, Kan.

## "A Highway for Anything in Reason"

Sir—Your timely editorial on highways in your issue of Dec. 6, is very interesting to an onlooker, but it would not have hurt if you had made it stronger.

There is no body of men of my acquaintance so prone to use the expression "It can't be done" as the highway engineers and their workers.

Years ago Melvil Dewey, probably the greatest librarian of our time, was asked when a public library should be open. His reply was: "Whenever the public would use it; 24 hours in the day if it were used." Why would it not be a good idea for the highway engineers and their assistants to "buck up" and adopt a similar plan of action with a slogan, "A highway for anything in reason to travel?"

The metalling of highways has reached a very high point, but it will not hold up the traffic, unless the foundation is good, any more than the rails of a railroad will hold up its traffic if laid on rotten cross-ties.

Jewett City, Conn. A. A. YOUNG.

## Enrollment in Engineering Schools and Engineers' Salaries

Sir—In several recent numbers of *Engineering News-Record* appear letters deploring the fact that the enrollment of students in the engineering schools has decreased, and there seems to be a fear on the part of certain engineers that there will be a shortage of engineering talent in the very near future.

It is generally conceded that the price of an article is governed by the relation of supply to demand, and that conversely the available supply in its relation to demand may be judged by the price obtainable. If this be true of engineering service—as it probably is—it would seem that there is an oversupply of engineers. An examination of the "Searchlight Section" of your paper shows a constantly decreasing space devoted to positions vacant, and a constantly increasing space devoted to positions wanted. A study of the salaries offered, taken in conjunction with the experience and education demanded, indicates that the employer is still very far from the point where he must shut up shop for lack of engineering help. A careful reading of the "position wanted" advertisements shows very clearly that in the majority of cases the advertiser is a man of experience and ability whose employer does not believe in the socalled shortage of engineers, nor in the increased cost of living.

My own experience is necessarily local, and my observations may not be of universal application, but it is a fact that among my acquaintances there has not been any general advance in salary, and that in the few cases where a small increase was granted to retain a man's services the increase was far less than the increased cost of living. It is also a fact that there is no demand for engineers except at the same old salary or at most a 10% increase. These remarks apply to men of $125 to $175 grade, and not merely to the failures, so that the writer for one does not feel any anxiety about the supply of engineers in the near future.

When we see an advance of from 25% to 50% in the salary of the average engineer, we may begin to take some steps to increase the number of engineering students, and offer to them an actual reason—expressed in dollars per month—why they should stay in the game. So long as the man with a grammar school education can make just as much money in the shop as the engineer with his expensive education can make in the office or on the job, there is not much reason to increase the supply of engineers. When the salary of the engineer increases in the same proportion as the wage of the laborer or of the mechanic, or even keeps step with the cost of bread and butter, he will be more favorably inclined toward the swelling of the ranks.

JOHN F. JOHNSON.

## Keeping Abreast with the Times

Sir—Last New Year's, I made a resolution to add something every day in the year to my notes on engineering. That resolution I have kept faithfully, allowing myself no holidays whatsoever.

The result has been that in less than a year I have written more notes than in six years of desultory work. In fact, the practice has been so beneficial to me that I wish to recommend it to all recent graduates, and to others who like myself have done little systematic work. Something written down in permanent form every day is the plan.

F. W. MULDOON.
Detroit.

### Garbage Adds Pound a Day to Weight of Hogs

In anticipation of feeding cantonment garbage to hogs, Prof. John M. Evvard, of the Iowa Experiment Station, made observations on eight pigs. At the start, these pigs weighed 52 lb. each. They were offered an average of 23.6 lb. of garbage daily for 70 days. Of this they ate an average of 19.6 lb. each, and added 0.96 lb. to their average weight, which was thus brought up to 120 lb. For the next 30 days one group of the hogs received garbage alone, as before, while another group were "self-fed" with middlings, in addition to the garbage. These hogs gave preference to the middlings and ate less garbage than the others, but took on no more weight than the hogs fed on garbage alone.

# HINTS FOR THE CONTRACTOR

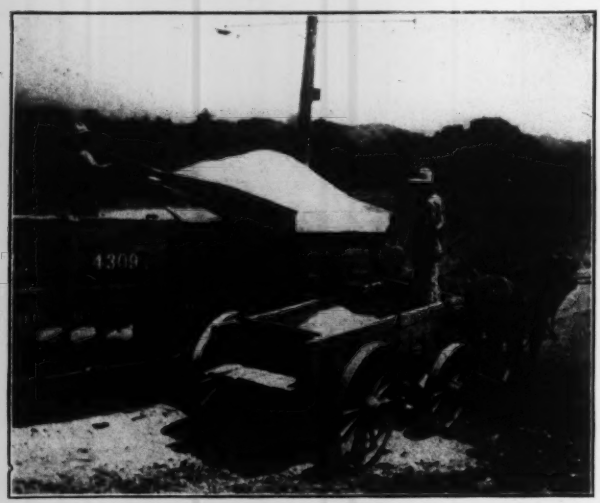
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

## Serviceable Unloading Box for Highway Work Cost Ten Dollars Complete

By E. Earl Glass

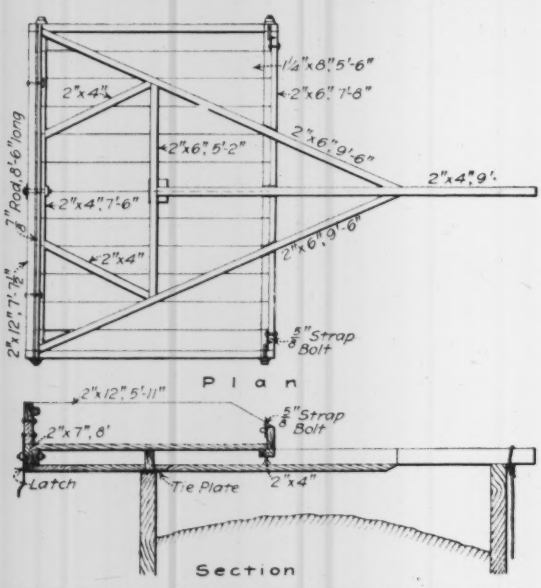
Monrovia, Calif.

AN UNLOADING box designed and used successfully in handling highway materials by the writer is shown in the illustrations. The box cost but $10 for material and labor, and contains only 145 ft. B. M. of



BOX CONTAINS ONLY 145 BOARD FEET OF LUMBER

lumber. The hardware for it was easily made. It has a hinged door at the front edge and revolves around the near edge of the car on a tie plate as shown in the drawing. This plate keeps it from slipping when tilted.




BOX HINGES ON TIE PLATE GRIPPING EDGE OF CAR

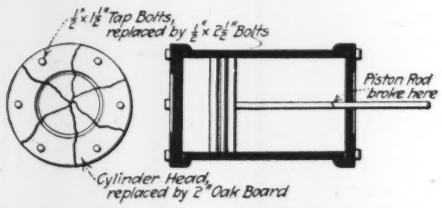
For security against shoveling too much of the material along the front edge, the pole reaching across the car is tied down by a rope to the truss rods below. The box is so light that one man can easily move it along the edge of the car as the stone is removed, by lifting it and putting a small pipe blower under the middle sill. The frame weighs 140 lb. and is the heaviest part of the box when dismantled. On this account it is a simple matter for one to move the box from car to car, which operation does not occupy more than 20 minutes.

## Oak Cylinder Head Enables Hoist to Run Until Repair Parts Come

By John G. Sullivan

Civil Engineer, Roos Bros., Cincinnati, Ohio

A CONCRETE hoist on one of the groups of buildings of the East Side High School at Cincinnati was recently delayed but 35 min. as a result of a broken piston rod and smashed cylinder head. The rod broke on a return stroke of the engine, the momentum forcing the piston through the cylinder head. No spare parts were obtainable in Cincinnati, and as a matter of fact



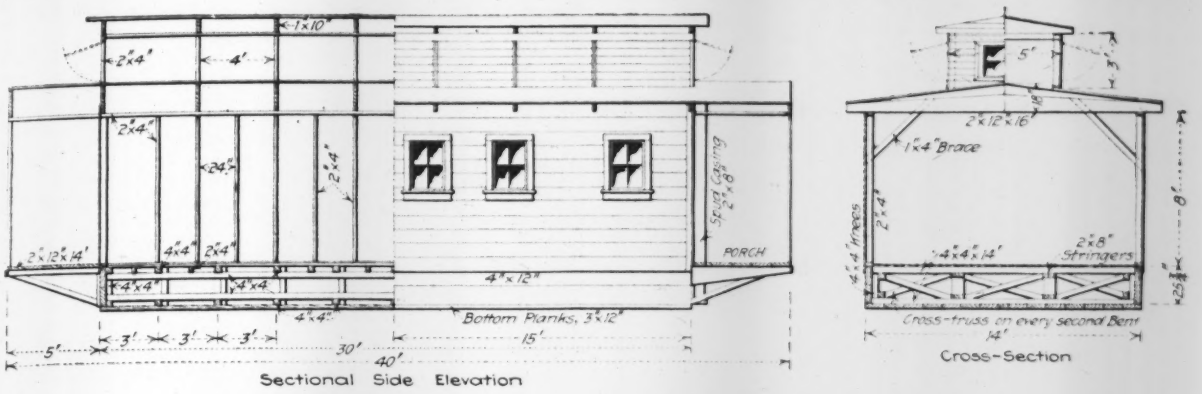

OAK HEAD RAN THIRTY DAYS

it required a week to get a new cylinder head and rod. The broken piston, however, was at once welded, and while this was being done the pieces of the cylinder head were put together and used as a template to make another one out of oak. The circle of bolt holes was laid out on a 2 x 10-in. oak plank, which was secured to the cylinder by using a new set of tap bolts one inch longer than the old ones.

The welded rod was replaced, and the oak cylinder head bolted on, so that the engine was again hoisting concrete within 35 min. of the accident. Although the new parts, which were ordered by wire, came within a week, they were not put on until a month later, when the welded piston rod broke again. In the meantime the makeshift cylinder head and the welded rod had raised something more than 1000 yd. of concrete.

## House-Boats with Steel Bunks Used for Dredge Crews on Ditch Work

HOUSE-BOATS used as quarters for dredge crews by R. H. & G. A. McWilliams, of Chicago, on many of their contracts for drainage ditch excavations, are shown in the accompanying drawing. The force for a dredge consists ordinarily of a foreman, two dredge




SINGLE-DECK QUARTER BOAT FOR DREDGE CREWS ON DRAINAGE WORK

operators, two cranesmen, two firemen, a launchman and from two to four coal men and extra men.

The house-boats are built with either a one-story or two-story superstructure. In the former case, two boats are used, one for the crew's quarters and the other for the galley, mess room and cook's quarters. The one-story quarter-boat generally contains three rooms; a combined office and sleeping room for the foreman, a

DOUBLE-DECK QUARTER-BOAT

sleeping room for the two dredge operators, and a large room for the rest of the crew. In a two-story boat, the first floor contains the galley and mess room and the upper floor is for the crew's quarters. The bunks are of steel, of the double-deck type.

The Kankakee River improvement on which this type of house-boat was used is described in this issue of *Engineering News-Record*, p. 1205.

## Motor Truck Dumps Five Batches in Succession Into Mixer Skip

MOTOR truck bodies designed to hold sand and gravel for five 3-sack batches of concrete are being used in Thurston County, Washington, to supply the paving mixer on the concrete road work being done by the Independent Asphalt Paving Co., Seattle. The truck backs up to the loading skip of the mixer, dumps the first batch by opening the tailgate, and stands there while this batch is mixed. The hinged bottom door of the next partition is then released by pulling out a latch, which permits the second batch to slide into the skip of the mixer. When the second batch has been mixed the third is dumped, and so on, until the truck is empty. The sides of the body and of the partitions are built up 6 in. higher than is necessary to contain the sand and gravel in each batch, so that the measured charges cannot run from one compartment into the other while the body is standing in the dumping position. Each batch contains 6 cu.ft. of sand and 9 cu.ft. of gravel. The trucks in use are 3-yd. size, and are accurately loaded at charging bins at a central gravel-handling statio..

Each truck takes from 9 to 10 min. to discharge all five of its batches at the mixer, which represents about 25% of the working time. The mixer crew, however, is so greatly reduced that this rather expensive method of unloading the trucks is much more than compensated, the contractor figuring that the wages saved are more than double the rental value of the truck for the idle time.

Moreover, none of the concrete material touches the subgrade, and in addition to the elimination of labor required for shoveling the sand and gravel up again, no material is wasted by being mixed with clay. According to the *Concrete Highway Magazine*, the total net saving in wages and material is estimated at $30 per day, or a little more than 5c. per sq.yd. of 6 to 8 in. concrete.

### Roads a National Not a Local Question

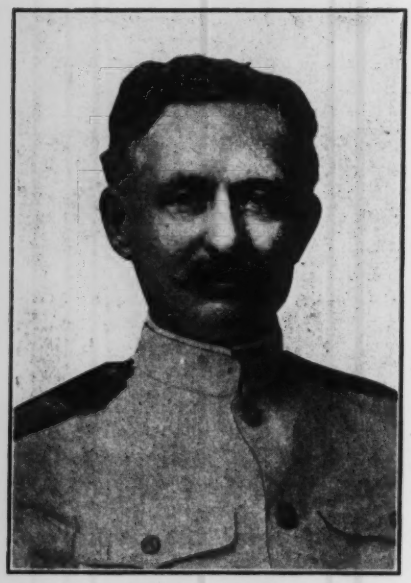
The only way we shall ever secure a proper road system will be by organizing a comprehensive and nation-wide system of building, according to a statement by Major P. S. Bond in *Motor Life*. For this there must be a centralized Federal bureau, whose duty shall be to block out the location of roads and standardize details of construction with a view to national usefulness, both military and economic. Building the roads of the United States is a full-size undertaking, and should be undertaken on a full-size scale. It is too big a matter to be left to the judgment of ill-informed local authorities and the juggling of politicians, and it is too national in its importance to be a subject for local consideration only.

# NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

## New Chief of Yards and Docks in Service Twenty Years

On Dec. 18, 1917, the President forwarded to the Senate the nomination of Charles Wellman Parks, a captain in the Corps of Civil Engineers, U. S. Navy, as Chief of the Bureau of Yards and Docks of the Navy, which position carries with it the rank of rear admiral. Rear Admiral Parks will succeed Rear Admiral Harris, who recently resigned as Chief of the Bureau of Yards and Docks to assume the duties of general manager of the Shipping Board, Emergency Fleet Corporation, from which position he resigned after about two weeks of service.



REAR ADMIRAL C. W. PARKS

Admiral Parks is 54 years of age, a native of Massachusetts. He is a graduate of the Rensselaer Polytechnic Institute, a school which has furnished the Navy with many of its civil engineers. He entered the Navy as a civil engineer July 19, 1897. His career in the Navy has been one of widely varied activity and increasing responsibility.

On Jan. 16, 1915, Admiral Parks was selected by the department as engineer in charge of the construction of the large naval station at Pearl Harbor, Hawaii, and in this position his chief responsibility has been the supervision of the construction of the large dry dock at that point, which has been regarded as the Navy's most difficult and important single piece of public works construction. Admiral Parks has had the satisfaction of virtually completing this work.

As chief of the Bureau of Yards and Docks, Admiral Parks will be in charge of the design and construction of the public works of the Navy, which include not only the upbuilding and maintenance of the diversified shore construction of the various navy yards and stations, but which also embrace the construction of barracks, hospitals, fuel oil stations, etc. His appointment is a recognition of his capacity as an engineer as well as an administrator.

## Defense Council Reorganizes Coöperative Work

### Committees of Industries Replaced by Specially Qualified Individuals

The Council of National Defense issued recently a statement which indicates that the Coöperative Committees of Industry, formed at the time war broke out, will be replaced by highly qualified individuals who will serve as Government employees and expert advisers and will ask the various industries to assist the Government by representative committees, created not by the Government but by the industries themselves.

While the Coöperative Committees of Industry have given faithful, patriotic and invaluable assistance to their country, many of the individuals serving on them have done so only at great personal and financial sacrifice, and were placed before the public in a position unfair both to themselves and to the Government, since they were called upon to act both as Government advisers and at the same time as representatives of the industry.

In dissolving the present Coöperative Committees of Industry, which were appointed by and under the direction of the National Defense Council, the action is taken with only the highest praise and thanks for the splendid, indispensable work of the various members and with the expressed hope that representative committees of the industries will be formed by the industries themselves at the earliest possible moment. The establishment of fresh committees, formed so as to entitle them to speak for their entire industries, will render immediately available valuable sources of information upon which the Government can draw in connection with the countless business and industrial problems attendant upon the conduct of the work necessary for the speedy and successful prosecution of the war.

The new arrangement will be far more workable from an administrative viewpoint than the old arrangement. It should prove a means for making permanent the mobilization of industry in a democracy at war. The type of organization which disappears on the issuance of this new order of the Council of National Defense is felt to have been perfectly satisafctory and adequate to the circumstances which arose when war was first declared and the country had to be taken over from a condition of peace to that of hostility.

## To Study Stream Pollution

Bad tastes and odors in the water-supply of Charleston, W. Va., have led to the appointment of a committee, which will investigate the pollution of the Elk River and perhaps lead to a state-wide investigation of West Virginia streams. Two engineers are members of the committee: A. M. Scott, chairman, and Mayo Tolman, secretary. Mr. Tolman is also chief engineer of the State Department of Health. Since its appointment the committee has organized as the Kanawha Basin Sanitary Commission and has appointed subcommittees on engineering, education and legislation. It is expected that a full-time secretary, an engineer, will be appointed, his compensation to be paid by public subscriptions.

## Cincinnati Increases Water Rates

Water rates in Cincinnati will be increased 25% beginning Jan. 1, 1918. The meter charge will be raised to 10c. instead of 8c. per 100 cu.ft., and the minimum charge of 30c. per month will be increased to 40c. The unmetered service will pay a straight 25% increase. For consumers outside of the city in unincorporated villages the meter rate will be 11c. per 100 cu.ft., with a 50c. minimum charge per month, and in incorporated villages the rate will be 12½c. per 100 cu.ft. J. A. Hiller, general superintendent of the waterworks department, estimates that the increases will produce additional revenue of about $120,000 per year.

## Ordnance Department Wants One Hundred Draftsmen

One hundred draftsmen to fill positions in the Ordnance Department, paying from $800 to $1800 per year, are needed quickly. Civil service examinations for these positions will be held in Chicago, Jan. 8, 9 and 10. Positions will be permanent. Applications should be filed with Milward Adams, secretary of the Civilian Personnel Committee, Ordnance Department, at offices of the State Council of Defense, Chicago, Illinois.

## Women To Supply Comforts to Engineer Regiments

An organization known as the Woman's Committee for Engineer Soldiers has been formed in Washington, D. C. Mrs. William M. Black, wife of Major General Black, Chief of Engineers, is president; Mrs. Charles Keller, vice president and chairman; Mrs. W. W. Harts, secretary, and Mrs. Ulysses Grant, 3rd, treasurer.

The object of the woman's committee is to see that no engineer soldier leaves this country without the proper knitted garments and to send garments to those already "over there." The national committee in Washington is to be headquarters for units all over the country and by purchasing yarn in large wholesale quantities should be able to get better prices and deliveries.

The dues are one dollar a year, and a very earnest appeal is made to every man and woman interested in the engineers of the Regular Army, National Army, the railroad, forestry, camouflage or labor regiments to join this organization or to send contributions of money for wool, or finished garments, to supply these hundred thousand men.

Address Mrs. William M. Black, 1730 I St., N. W., or Mrs. Ulysses Grant, 3rd, 2204 R St., N. W., Washington, District of Columbia.

## Favor Retention of State Highway Engineer of New Jersey

Hearing that Robert A. Meeker, state highway engineer of New Jersey, had been asked to resign, the New Jersey State Association of Highway Engineers, at a meeting held on Dec. 12, unanimously adopted a resolution requesting the state highway engineer to retain Mr. Meeker in office. The arguments advanced for Mr. Meeker's retention were expressed as follows:

"Mr. Meeker has acted as state highway engineer for the past 17 years or more, making it practically his life work. In this time the state has passed through many phases of road building in experimentation and construction work, due to changing traffic conditions, and in this time Mr. Meeker has acquired a statewide knowledge of the roads and their needs, traffic conditions, local engineering problems and other phases of road building which is held by no other engineer, and which could only be acquired through similar long experience and many experiments.

"During past years the road department has been handicapped by poor legislation and lack of funds, in spite of which difficulties Mr. Meeker's work has been highly efficient, and it is our belief that under the present highway act Mr. Meeker will have unlimited opportunities to show his fine worth to the people of this state.

"In view of the great road building program now planned by the state, this association feels that Mr. Meeker's ability and knowledge render him peculiarly fitted to act as state highway engineer."

# Secretary for Joint Activities of Big Societies

### Alfred D. Flinn Selected—Has Had Broad Engineering, Executive and Organizing Experience

For economy of administration and the furtherance of coöperation among organizations representing the profession, the United Engineering Society, the Engineering Foundation and the Engineering Council recently decided to join in one suite of offices in the Engineering Societies' Building, New York City, and engage a joint secretary. For this position the engineer selected is Alfred Douglas Flinn, now deputy chief engineer of the Board of Water-Supply of the City of New York. This combination of the secretaryships of these three central bodies is looked upon as the first large fruit of the removal of the American Society of Civil Engineers to the Engineering Societies' Building, thus verifying the prediction made when that removal was proposed —that if accomplished it would lead to close coöperation of the leading engineering bodies.

#### Activities Joined

The United Engineering Society was formed some years ago by the National Societies of Civil, Mining, Mechanical and Electrical Engineers to coördinate joint activities and provide for holding property in common. This body acts as the holding company for the four founder societies and is landlord of the Engineering Societies' Building in New York, in which the founder societies have headquarters. In it also is vested the title to the library housed in the same building, which, with the recent addition of the collection of the American Society of Civil Engineers, is now the most important engineering library in the country.

The Engineering Foundation Board was created, as a department of the United Engineering Society, to administer the endowment made by Ambrose Swasey three years ago for the support of engineering research for the benefit of the profession and of humanity. The large sum of money he gave will form, it is hoped, the nucleus to which other gifts will be added.

The last of the three organizations which are to have a joint secretary is the Engineering Council. For years it has been recognized that there were certain activities affecting engineers which could not be properly handled by any one of the individual engineering professional societies. To meet this need there was created during the past summer the Engineering Council "for the proper consideration of questions of general interest to engineers and to the public, and to provide the means for united action upon questions of common concern to engineeers."

#### Mr. Flinn's Career

Mr. Flinn, in whom these secretaryships will be joined, was born in New Berlin, Penn., in 1869, and was graduated from Worcester Polytechnic Institute in 1893. In August, 1895, he became a member of the engineering staff of the Metropolitan Water-Works, Boston, and remained with that organization until 1902. He rose steadily until he became principal office assistant under the chief engineer, Frederic P. Stearns, in charge of designs on the Wachusett dam, Weston aqueduct and other structures coming under the authority of the Metropolitan system. During the latter years with this organization, he lectured on water-works and sewerage in Lawrence Scientific School, Harvard University.

ALFRED D. FLINN

On leaving the Metropolitan Water and Sewerage Board, he became managing editor of the *Engineering Record* and continued in that capacity until August, 1904, when the position of general inspector of the Croton aqueduct commissioners was offered to him. He remained in that position for about a year, and upon the organization of the Board of Water-Supply of the City of New York, which was established in 1905 to build the new Catskill aqueduct and its appurtenant structures, he became department engineer in charge of the headquarters department. The magnitude of this assignment will be apparent when it is remembered that to that department were entrusted the design, preparation of contracts and specifications, inspection of materials, the researches and investigations for all of the structures of this $177,000,000 enterprise. Moreover, it involved the organization and equipment of the engineering forces of the board and the handling of a tremendous amount of detail connected with an enterprise of that magnitude.

He continued as department engineer until August, 1914, when he was made deputy chief engineer. He has continued in that capacity until his election

to the secretaryships referred to in this article.

Mr. Flinn brings to the position a broad executive and organizing experience, as this brief biography indicates. He is especially successful in laying out large problems and in securing for their execution the hearty coöperation of his co-workers. The positions on which he enters require those qualities in a high degree, and this was the determining factor in Mr. Flinn's selection.

Mr. Flinn is a member of the board of direction of the American Society of Civil Engineers and chairman of its committee on library.

## Vehicle Tunnel Under Hudson Favored by Commissions

Construction of a large size vehicle tunnel under the Hudson River connecting New York and Jersey City is recommended by special commissions of the States of New York and New Jersey, which have been considering the problem jointly and have just submitted reports to Governors Whitman and Edge respectively. Interstate commissions on bridges and tunnels have existed in both states for a number of years, but the New Jersey commission was put on a new footing last year by legislative action following a study of the Hudson River vehicle-tunnel project by the Public Service Corporation of New Jersey. The report of this study, known as the McCarter report, adopted a tunnel location from the prior report of Jacobs & Davies, who were consulting engineers for the Interstate Bridge and Tunnel Commission and some years ago reported a project for two parallel shield-driven tunnels each carrying one roadway. The McCarter report, however, abandoned the shield-tunnel method and recommended building the tunnel in a dredge trench in the river bottom by sinking separate sections built on the surface and joining them in place. Maj. Gen. George W. Goethals was appointed consulting engineer to the new joint commission and was directed to consider the tunnel plans previously submitted. In a report submitted to the commission recently, he uses the same location, a line from Canal and Varick Sts., New York, to 13th and Henderson Sts., Jersey City, but he rejects the trench method of tunnel construction as impracticable on account of the softness of the silt in the bottom of the Hudson River. He says: "The Hudson River silt overlies the rock as an unstable mass, affected by tidal fluctuations and temperature changes. It can be handled easily by dredges, but the very character of the material precludes the possibility of securing a trench of the dimensions required within a reasonable time and at a reasonable cost. The upper strata, in close proximity to the water, are in such a liquid state as to be set in motion by the passage of deep-draft vessels. To cut a deep trench across the tidal currents through material which reduces to a practically fluid state when water has access to it becomes a serious and difficult task." He therefore recommends the adoption of the shield method. As between a single tunnel or a pair of tunnels he advocates the single tunnel "made large enough to provide for slow trucking below and the faster, lighter motor cars above." The cost can be reduced by using concrete blocks molded as voussoirs of an arch or ring, properly keyed, in lieu of steel or cast iron. It is estimated that such a tunnel can be constructed at present market prices for material and labor for a sum not exceeding $12,000,000." With the submission of this report to the two commissions, an offer of John F. O'Rourke and associates to build the tunnel complete for $12,000,000 was submitted. It is understood that this proposal contemplates a tunnel of 42 ft. outside and 36 ft. inside diameter, driven by shield, formed of a concrete-block shell, and divided by a middle floor into upper and lower roadways, with ventilating chambers in narrow segments at each side.

The joint commissions last week adopted General Goethals' report and recommendations, and laid their conclusions before the governors.

## Water Users Get Salt River Reclamation Project

Without celebration or even newspaper heralding, the Salt River Project of the United States Reclamation Service has been turned over to the Salt River Valley Water Users' Association. As the December *Reclamation Record* says, "Evidently the exchange of a property valued at $15,000,000 is not news in the valley, for nothing was printed about it." The event took place Nov. 1. A force of 400 engineers and other employees, under the immediate charge of W. S. Cone, project manager, were turned over in a body to John P. Orme, president of the association.

The project system as planned has been practically completed for some time, and on Jan. 18 Secretary of the Interior Lane issued the public notice announcing construction charges, irrigable lands, etc., in accordance with section 4 of the Reclamation Act. Negotiations between the Government and the association resulted in a contract, Sept. 6, by which the association assumes full management of the project works, including outstanding obligations and contracts, and repays the construction cost in 20 annual installments of 2, 4 and 6%. The first payment was due Dec. 1.

The association receives all income arising from operation and agrees to maintain the works in as good and efficient condition as when taken over, excepting only the depletion of storage capacity by natural silting and injury by public enemies or by the United States as a war measure, which shall suspend or postpone repayments. To secure proper maintenance the works are subject to inspection under the direction of the Secretary of the Interior, and his prior written consent is necessary before making any substantial change in the works. The association holds the United States harmless as to damages arising from operation and maintenance. It must operate in accordance with the requirements of law as well as the rules and regulations, past and future, issued thereunder by the Secretary of the Interior, and will use its powers to enforce these.

The association may terminate the agreement on Mar. 1 of any year by written notice a year before. The Secretary of the Interior may terminate it at any time if the association fails to carry it out, or if he reasonably believes the security for the Government's investment is being impaired.

When national reclamation began the association had 1000 farmers; now there are 3500. Some years 80,000 acres were watered before the construction of the famous Roosevelt dam storing 1,300,000 acre-feet, now bumper crops are raised on 200,000 acres, valued at $13,700,000. The net cost of the works as of June 30, 1917, was about $10,500,000.

## Western Society Issues News Bulletin

"To serve as a medium of current thought and a chronicler of events worth while to its members" is the announced reason for the 8-page monthly bulletin recently started by the Western Society of Engineers. Another avowed purpose is "to knit together the engineers of this vast community into a forceful whole."

War has stirred the organization to its foundation, for 10% of its members and five of its 15 directors are in service. At a recent board meeting instructions were given to the program committee to book no addresses or papers that did not have to do with the war. After devoting the whole of a special meeting to the question of engineering students completing their courses, resolutions directed to the Secretary of War were passed, agreeing substantially with the ideas set forth in the editorial in *Engineering News-Record* of Nov. 29, p. 995.

Subjects having to do with the war, scheduled for the five weekly meetings beginning Dec. 3, are as follows: "Symposium on Cantonment Construction," C. B. Burdick, consulting engineer; Profs. N. B. Garver and A. C. Willard, University of Illinois; "What the War News Means," S. Duncan-Clark, *Chicago Evening Post;* "What the War Means to the Engineer," E. J. Mehren, vice president and editorial director, McGraw-Hill Publishing Co., Inc.; "The Relation of Science and Engineering to the War," Maj. Robt. A. Milliken, vice chairman and executive officer, National Research Council. At the annual meeting in January some phases of war's effect on railway valuation will be handled by Pierce Butler, general counsel for the Western carriers.

## Chicago Engineers Help Ordnance Recruiting Committee

To expedite recruiting of Chicago's quota of the 9000 men required in the Ordnance Base Depot in France, an Ordnance Recruiting Committee of the Military Training Camps Association, made up largely of engineers, has been formed. From the Chicago district 2000 men are expected. The division will be a military organization, but at present men who are exempt from the National Army under the provisions of the selective service draft cannot be accepted. Men from 18 to 40, over or under draft age, or men of draft age not yet ordered into camp, may be accepted. Wives or other dependents are provided for—the wife receives one-half of husband's pay, plus $15 a month, plus $10 a month for one child, plus $5 a month for each additional child.

Men of almost every vocation are needed, particularly automobile repairmen, cooks, gunmakers, harness makers, machinists, millwrights, optical instrument repairers, painters, steel polishers, plumbers, etc. These men will be stationed back of the fighting front of the American Army in France in warehouses and repair shops.

Pay ranges from $30 to $61.20 per month. Enlistment is for the duration of the war as privates, but there is opportunity for promotion. A special recruiting station has been opened at 435 S. Dearborn St.

## Short Intensive Course Offered in Naval Architecture

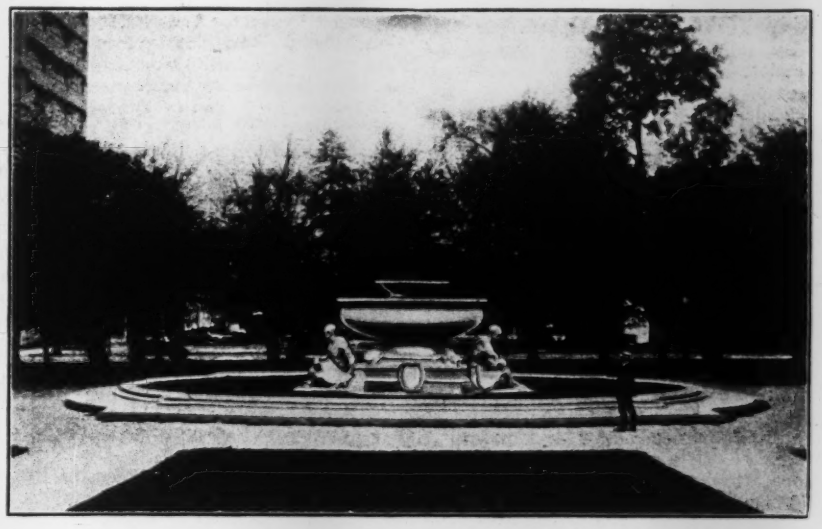
The Massachusetts Institute of Technology will have, from Feb. 4 to May 24, a special intensive course in naval architecture, open to the graduates of technical schools and other persons having the same preparation. The course is under Professor Peabody, and is stated to give a good training in theoretical principles and in ship design. Students already registered at the Massachusetts Institute of Technology will pay for the special term $25 in addition to the regular tuition fee for the second term. Those who register for the interim course only will pay full tuition for a term, namely, $150. Further information on the course can be obtained from Prof. C. H. Peabody, department of naval architecture and marine engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts.

## Movement to Coördinate Ohio Engineering Societies

A conference to promote the coördination of all the engineering organizations of Ohio will be held at Columbus on Jan. 29, in Brown Hall, Ohio State University, with Prof. Clyde T. Morris as chairman. All the engineering societies of the state, including local sections of national organizations, are invited to send delegates. It is expected that a permanent organization will be formed, the business of which will be transacted by the Engineers' Club of Columbus. The date named was chosen because it is just before the opening of the annual meeting of the Ohio Engineering Society, at Columbus, Jan. 30, 31, and Feb. 1, thus saving a year's delay on the part of the society in the endorsement of the project. Officials of nearly all the engineering societies of Ohio have given evidence of hearty support of the movement.

## Alfred Noble Memorial Fountain Nears Completion

Accompanying is a view of the Alfred Noble Memorial erected by the American Society of Civil Engineers in Rawlins Square, Washington, south of the building of the Department of the Interior.



ALFRED NOBLE MEMORIAL SYMBOLIZES THE CHARACTER OF THE ENGINEER TO WHOM IT IS DEDICATED

A progress report on the work is presented by the memorial committee in the November "Proceedings" of the society. Quoting from the report, which was written before the work was so far advanced:

"After studying and discarding many compositions based on the above ideas, the models shown have been selected as combining best the features desired—a fountain befitting the site, and a memorial to an eminent engineer, symbolizing by its form and sculpture the character of the man and his life.

"The dominant architectural element is the large elliptical bowl, set on a solid base and flanked by the dominant sculptural element, two strong seated figures. The memorial will rise from a large basin of water, 37 ft. wide and 63 ft. long, surrounded by a wide stone coping.

"The sculptural figures are intended to show the strong elements in Alfred Noble's character—thought in preparation, force in execution. Each figure will hold a scroll upon which will be carved an example of the work by which Alfred Noble is so well known and appreciated."

Paul Bartlett is the sculptor for the memorial, Glenn Brown and Bedford Brown serving as his architectural advisers. The committee consists of Onward Bates, chairman; Maj. Hugh L. Cooper, Samuel Rea, Samuel H. Hedges, F. H. Newell, W. W. Harts and Charles Warren Hunt. Major Cooper succeeded Robert Moore, resigned.

## Engineering Council Broadens Its Scope

At the meeting of the Engineering Council on Dec. 6, a report was adopted providing a method for electing to its membership engineering and technical societies other than the four national organizations to which representation is now restricted. The new rules go to the governing bodies of the four founder societies for their consideration.

## Pittsburgh Transit Bureau Continued Another Month

The expected report on rapid transit in Pittsburgh is to be completed about Jan. 15, 1918, and in order to finish the work the Transit Bureau will be continued during January, according to a recent resolution by the city council. The bureau, headed by E. K. Morse, was formed a year ago for the purpose of studying Pittsburgh transit and reporting on it by 1918. A recent statement by Mr. Morse to the council's finance committee indicates that he will recommend immediate construction of rapid-transit lines.

## New England Water-Works Association Election

At the annual meeting of the New England Water-Works Association, to be held in Boston, Jan. 9, there will be an election of officers. The polls will close Jan. 9, at 2 p.m.

## Confer on Garbage Piggeries at Chicago

**Discuss Sanitary and Economic Phases of Garbage Feeding To Utilize Wastes .**

Realizing that the public is now in a receptive mood for education in the utilization of garbage to the full extent possible and that one of the means to that end now being proposed to city officials is to add to the municipal garbage piggeries now in existence, I. S. Osborn, in charge of the division of wastes disposal of the Federal Food Administration, held a conference on the subject in Chicago, Dec. 7. There were present twenty-five sanitary engineers, health officers, superintendents of piggeries, both municipal and private, meat packers and officials of the Department of Agriculture, Bureau of Animal Husbandry.

Mr. Osborn explained that it was his purpose to obtain for Mr. Hoover the best information on feeding garbage to hogs as an economical and practical method of waste utilization. The hoped-for result would be to increase the meat and fat supply and to decrease the cost of garbage disposal. Feeding has had a checkered career, due, in his estimation, to mismanagement and lack of knowledge. The Food Administration is desirous of educating the public and promoting only what will prove to be a success.

Thomas Horne, Worcester, Mass., explained the conditions of feeding on the Worcester farm (see *Engineering News-Record*, Aug. 30, p. 398). The 1917 figures of operation are now available, as his year ended Nov. 30. There was sold $51,800 worth of pork raised on 65,014 tons of garbage. The cost (after collection) at the farm was $2.30 per ton, leaving a net pork value of $5.66 per ton for the garbage delivered at the farm. Mr. Horne values the equipment at $67,000, itemized as of Nov. 30, as follows: 40 acres land, at $100, $4000; buildings and platforms, $20,000; 2096 hogs, $42,000; miscellaneous, $1000.

The garbage of Grand Rapids is collected and loaded on cars by the city. Alvah H. Brown ships it every day 27 miles to his 80-acre farm in an isolated section, located on sandy soil. He pays 45c. per ton for freight and 25c. to the city. He feeds inside a long building, on concrete platforms, onto which garbage is dumped directly from the cars. Glass from electric-light bulbs are the worst "foreign" matter in garbage. Sheep and cattle have also been fed garbage in winter, but not in summer. Corn silage is fed on Sundays and a cheap "fire sale" grain is usually part of the bill of fare. Platforms are cleaned daily of manure, which is composted nearby.

Mr. Brown believes that hogs could be fed without nuisance in a building within the city limits if proper attention were given to ventilation. One ton will feed 100 pigs. He employs 12 men to care for 6000 hogs. Hotel garbage is worth ten times as much as household garbage, in his estimation. Cooking is not desirable, as it reduces the garbage to a slop in which the pig gets no chance to discard grapefruit and things which do not agree with his digestion. All feeders agreed that cooking is a mistake for household garbage. For hotel wastes, rich in recoverable fats, it is practical. Mr. Brown gets daily 500 lb. of bones worth 1c. a pound. In October 1015 tons of garbage were fed.

Peter Gibson, St. Louis, collects from 600 houses and gets coöperation by telling the householder something of the feeding business and, therefore, the desirability of separating the glass, cans and coffee grounds from the garbage. Letters on the subject left by the collectors aided in eliminating 75% of the difficulties from these causes.

Dr. Charles V. Chapin, health commissioner, Providence, said that garbage handling, as ordinarily practiced in Northern cities, was not a sanitary problem, but one of economics and convenience.

Dr. E. A. Cahill, Massachusetts Bureau of Animal Industries, was emphatic in his warnings to go slow in promoting feeding until plenty of safeguards against disease and its spread were known and observed. In his opinion, there were serious doubts as to whether the food values salvaged in this way would not result ultimately in a decreased meat supply due to increased cholera and other diseases disseminated by this means. The garbage-fed hog eats infected material (uncooked pork scraps from uninspected animals) all the time, while the grain-fed hogs are rarely exposed. A piggery can be kept immune, but it is a difficult and scientific problem to do it continually.

Doctor Wells, of the C. O. Bartlett & Snow Co., indicated that experiments are under way to produce a dessicated garbage for stock food. A firm in Pasadena now dries garbage to 18% moisture by the old Anderson process and sells the product as chicken feed.

The results of the conference and other information will be digested by Mr. Osborn's bureau and then made available.

## Production of Bituminous Coal Reaches High Rate

The November production of bituminous coal was, with one exception, the largest in any month in the history of bituminous coal mining in America. A preliminary estimate placed the output at 47,747,000 net tons. January, 1917, recorded 47,788,000 tons, but in 26 working days as against 25, or 25.5, for November.

The average production per working day during the month was 1,872,432 tons. The November rate has been exceeded only once in the last two years, when in February, 1916, the average production per working day rose to 1,882,771 tons.

### Index to This Volume

The index to the present volume (Vol. 79) of *Engineering News-Record* will be published with the issue of Jan. 10. Subscribers who bind their copies should make a point of detaching the index from that issue.

## City-Manager Plan Upheld by New York Court

The optional city government statute of 1914, under which Niagara Falls and Watertown, N. Y., adopted the city-manager plan, was declared constitutional by the New York State Court of Appeals on Dec. 21, reversing the decision of the lower court.

# ENGINEERING SOCIETIES

## Calendar

### Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 21-23, Montreal; Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; Feb. 7-9, Chicago; H. B. Alvord, secretary.

**The Engineers' Club of Dayton** held its regular midmonthly meeting Dec. 18, the lecturer of the evening being Prof. A. W. Smith, of the Ohio State University, Columbus. His subject was "Modern Conceptions of Electricity and Heat," and brought out the latest phases developed by laboratory research.

**The Kansas City Chapter of the American Society of Heating and Ventilating Engineers**, at its November meeting, discussed the subject of "Wind Leakage and Its Effect on Heating and Ventilating," as presented by H. W. Whitten. Suggestions on fuel conservation were made by P. W. Thomas, fuel engineer of the Central Coal and Coke Company.

The eleventh annual meeting of the **Kansas Engineering Society** will be held at Lawrence, Jan. 15-16. While

the society has lost a good many active members, who have joined the army, the new highway law has furnished it with a good many county engineers. The program has not yet been completed, but there will be a paper from one of the instructors from the engineer officers' training school at Ft. Leavenworth; one from one of the cantonment construction force from Camp Funston; one from a member of the engineering force of one of the large oil companies and one from the Cement Gun Company.

**The Engineers' Subdivision of the Chicago Association of Commerce** on Dec. 19 elected the following officers: Chairman, G. R. Brandon; vice chairman, W. W. DeBerard; members of executive committe, J. N. Hatch, E. T. Perkins and W. M. Kinney.

The newly formed **Washington, D. C., Chapter of the American Association of Engineers** elected Dec. 14 the following officers: President, F. R. Weller, consulting engineer; vice presidents, A. S. Grossberg, chief designer, Bureau of Yards and Docks, and Harry Stevens, consulting engineer; corresponding secretary, Capt. D. S. Hays; recording secretary, A. P. Connor; treasurer, O. M. Sutherland. Major Zimmerman, of the Engineers' Depot, addressed the chapter on the foreign experiences of engineers. This meeting was attended by 150 engineers, including Admiral F. R. Harris, then chief of the Emergency Fleet, Admiral Baird and Major Harrison. The chapter numbers more than 100 and has headquarters at 502 Hibbs Building.

**The Engineers' Club of Oakland, Calif.**, at an election held Dec. 12 elected the following officers: President, R. S. Chew; vice president, R. M. Henningsen; secretary, Romaine Myers.

**The Municipal Engineers of the City of New York** held a meeting Dec. 26, at which a paper on "Architectural Design of Subway and Elevated Stations" was presented by F. J. Vickers, designing architect, Public Service Commission. The paper was illustrated by lantern slides.

At the annual meeting of the **Engineering Society of York, Penn.**, held recently, the following officers were elected for the ensuing year: President, James Rudisill; vice president, Chauncey D. Bond; secretary, M. Haller Frey; treasurer, Harold A. Russell; directors, George A. Jessop, Charles L. Berger, Howard J. Longenecker.

**The Ohio Engineering Society** will hold its annual meeting at Columbus Jan. 30 to Feb. 1. Part of the time will be devoted to a joint meeting with the Ohio Good Road Federation and the County Commissioners' Association.

**A Reorganization of the Waco, Tex., Society of Architects and Engineers** has been effected, and the following officers have been elected for the year: President, E. M. Ross; first vice president, R. J. Potts; second vice president, F. L. Booth; secretary-treasurer, Roy E. Lane.

At the annual meeting of the **Brooklyn Engineers' Club**, held Dec. 20, the following officers were elected for the coming year: President, G. Laurence Knight; secretary, Joseph Strachan; treasurer, Carroll S. Dunphe; directors, Calvin C. Hough and H. P. Quick; auditing committee, J. Barth Cronin, Andrew Nicola and E. M. Van Norden.

## PERSONAL NOTES

J. D'ESPOSITO, principal assistant engineer of the Pennsylvania Lines, at Chicago, has gone to the Emergency Fleet Corporation at Washington, being assigned to help Mr. Heyworth, who is in charge of the program for construction of wooden ships.

D. S. BENNETT, structural engineer in reinforced concrete, Wausau, Wis., and the only engineer member of the last Wisconsin legislature, has received a commission as first lieutenant in the Signal Corps. Lieutenant Bennett is a veteran of the Spanish-American war, having served as sergeant major in the First Squadron, Third United States Cavalry.

N. D. BRAINARD, superintendent for the Austin Co., industrial engineers and builders, who was formerly at Baltimore, is now at Buffalo, New York.

J. G. SCRUGHAM, state engineer of Nevada, has been commissioned a major in the Ordnance Department of the National Army, and will resign his position as state engineer.

G. T. MCCLEAN, city engineer of Astoria, Ore., recently received a leave of absence for 100 days, granted by the City Council, so that he may attend an engineers' training camp.

WALDO S. COULTER, until recently of the firm of Hansen & Coulter, New York, which was dissolved, has opened offices in the Engineering Building, New York, as a consulting, designing and supervising engineer.

E. L. HILL, recently appointed assistant to the general manager of the Erie R.R., with headquarters at New York, was formerly assistant in the engineering department of the Erie at New York.

CHARLES H. EWING, who has been appointed vice president of the Philadelphia & Reading Ry., with headquarters at Philadelphia, was the general manager of the railway before his recent appointment. He was born in Chester County, Pennsylvania, May 26, 1866, and entered railway service in August, 1883, as rodman with the engineer corps construction department of the Philadelphia & Reading. After serving the road as transitman, assistant engineer in charge of construction and maintenance, roadmaster and division engineer, he went to the Central New England Ry. as chief engineer in 1893. He returned to the Philadelphia & Reading Ry. in July, 1902, as division engineer of the Reading & Lebanon Division, and in June, 1905, he became engineer, maintenance-of-way, with headquarters at Reading. In 1910 Mr. Ewing became superintendent of the Atlantic City R R., and on Jan. 1, 1913, general superintendent of the Philadelphia & Reading. In March, 1916, he was promoted to the position of general manager.

PAUL KIRCHER, until recently connected with the Universal Portland Cement Co., as engineer in the promotion bureau, is now office engineer of the C. F. Massey Co., Chicago.

CHARLES A. CLARK, recently assistant superintending engineer of Vermilion County, Illinois, bond issue roads, is now with the Kansas City division of the Portland Cement Association.

GEORGE G. ANDERSON, consulting civil engineer, Los Angeles, recently resigned from the advisory board of consulting engineers for the Imperial Irrigation District, California.

NATHAN C. ROCKWOOD, formerly assistant editor of *Engineering News*, has been appointed editor of *Rock Products*, published in Chicago. Mr. Rockwood has been engaged for several months in compiling an index to *Engineering News*, from 1910 to 1917.

WILLIAM A. ROYCE, who was city engineer of Traverse City, Mich., until recently, resigned and is now mining engineer for the Round Valley Tungsten Co., Bishop, California.

GEORGE C. LOVE has moved his office and residence from Pineola, N. C., to Newland, N. C., and will continue in the practice of civil engineering at the latter place.

J. DUNCAN JACQUES has resigned his position as assistant chief of construction with the New Jersey Zinc Co., of Pennsylvania, and has been appointed division engineer with the Department of City Transit, Philadelphia, in charge of subway construction.

## OBITUARY

A. J. LA TORNELL, formerly city engineer at Edmonton, Alberta, is dead of wounds received while fighting in France recently.

H. D. LANGWORTHY, superintendent of the water-works of Macon, Ga., died at his home there, Dec. 11. Mr. Langworthy went to Macon six years ago from Kansas City. He designed Macon's new water plant and supervised the construction of the water mains to Camp Wheeler. He was thirty-three years of age.

# BUSINESS NEWS

## Byers Auto-Crane Builds Ships

In the accompanying view is shown a typical example of how the material is handled on wooden ship construction in several of the new yards now being operated to capacity. The crane is a model C "Auto-Crane" made by the John F. Byers Machine Co., Ravenna, Ohio, equipped for the work with a 40-ft. boom. Such a machine is self-driven, runs on a standard-gage track alongside the shipways and can handle seven tons on an 18-ft. boom length. This particular machine is in use at the Bagdad Shipbuilding Co., Pensacola.

SELF-RAISING CRANE ON WOOD SHIP CONSTRUCTION

The Contractors' and Builders' Show, successor of the former annual cement show, planned to be held in Chicago, Feb. 6 to 13, has been postponed on account of the unsettled conditions in the building field.

The Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Penn.,.is preparing a calendar for 1918, which gives illustrations of the Belmont Iron Works products, and which is sent free to anyone interested.

D. M. Ferguson, formerly of the National Transit Co., Oil City, Penn., is now director of publicity for the American Steel Exports Co., New York.

George H. Tefft, for 15 years secretary and sales manager for the W. S. Dickey Clay Manufacturing Co., has been made secretary and general manager of the Clay Products Association, Chicago, which is the successor of the International Clay Products Bureau, Kansas City. Mr. Tefft was secretary of the latter organization, in addition to his company duties. The Clay Products organization is composed of 30 leading manufacturers of clay products, including sewer pipe and blocks, wall coping, drain tiles, fireplace flumes and chimney pipes. The association has opened offices in the Chamber of Commerce Building, Chicago. Besides Mr. Tefft the officers are L. G. Blackmer, president, and W. D. Gerber, consulting engineer. The purpose of the association is to promote the use of clay products and to maintain high standards of manufacture. It will maintain physical and chemical laboratories and will cooperate with the American Society for Testing Materials in work relative to clay products.

The Southern Canada Power Co., Montreal, which supplies light and power to 47 cities and municipalities in western Quebec and controls five developed and six undeveloped sources of water power, has elected W. C. Hawkins as president. Mr. Hawkins is well known in the United States in connection with public utilities. He went to Canada in 1903 to manage the Dominion Power and Tramways Co., Hamilton, Ontario.

William L. Guenther, vice president of J. Jacob Shannon & Co., Philadelphia, died Dec. 15, in his 47th year. He was connected with the company for about 27 years.

*Notes from*

# MAKERS OF PLANT AND EQUIPMENT

**The Universal Motor Co.**, Oshkosh, Wis., has just completed a two-story addition to its plant, 40 x 180 ft. in plan. This new edition, of reinforced concrete, contains a department for testing marine motors and generating sets. The call for these generating sets by the Government has been so urgent that the works are pretty nearly filled up with the task of supplying 4-kw. units powered with a 4-cycle, 4-cylinder, 2⅝ x 4-in. gasoline motor.

**The Pulsometer Steam Pump Co.** has established new executive offices in the Candler Building, 220 West 42nd St., New York City. The company is enlarging its factory at Irvington, N. J., approximately 125 per cent.

**The Dry Milling Engineering Co., Denver, Colo.**, which was recently incorporated, has been appointed Western agent for the Raymond Bros. Impact Pulverizer Co., Chicago. The head of the former concern is William B. Senseman. This company represents also the Buckeye Dryer Co., London, Ohio; the Dust Recovering and Conveying Co., Cleveland, Ohio, and the Quigley Furnace Specialties Co., New York.

**The George W. Ziegler Machinery Co., Pittsburgh**, has become the active representative of the Ransome Concrete Machinery Co., in Pittsburgh, succeeding George W. Ziegler.

**D. S. Bright** has become district sales manager for the Concrete Steel Co., Cleveland, Ohio. He has been connected with the company for about three years, and before that was connected with the Pittsburgh Construction Co. and the Concrete Products Co., both of Pittsburgh.

**The Asbestos Protected Metal Co.**, of Pittsburgh, is now represented in Georgia by J. F. Schofield's Sons Co., with offices at Macon.

# APPLIANCES AND MATERIALS

## Leaks Automatically Close with This Non-Calked Pipe-Joint Filler

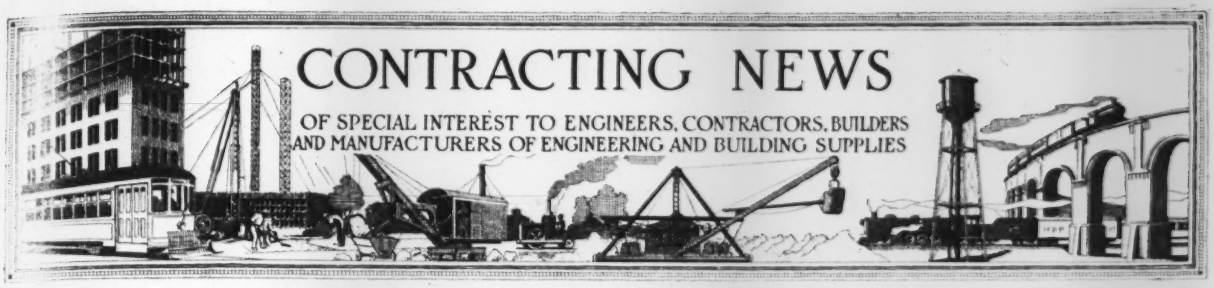
Metalium as a substitute for lead in joints of water mains is used by the Metropolitan Water District of Omaha, Neb. It is a metalloidal composition or alloy, which is melted and poured in the usual way. When ready to pour it is a thin, black, oily-looking liquid, but if made too hot it thickens and does not pour readily. A special furnace has been designed for melting it, but the ordinary lead furnace may be used if the grate area is reduced by firebrick and clay.

It is very important to have the bell and spigot of the joint thoroughly clean and free from oil or grease. For this reason nothing but unoiled jute yarn should be used for packing. At Omaha all lumps and blisters in the pipe coating of the bell and spigot are removed by a putty knife, and after the joint is yarned a loose strand of yarn is inserted to prevent the entrance of dirt before the filler is poured.

The joint runner may be of any form, and is smeared with wet clay before placing it around the pipe. The clay gate must be larger than for lead, and should be 6 or 8 in. high above the spigot. It is made by the aid of a conical wooden gate-peg 10 in. long, 2 in. in diameter at the bottom and 3 in. at the top. The bottom of this is inserted between the ends of the joint runner and clay is built up around it. The peg is then turned two or three times and withdrawn, leaving a well-formed gate of the proper weight. The metalium gate buttons can be remelted after being thoroughly cleaned and broken up.

The advantages claimed for metalium as compared with lead are low cost, a low melting temperature (about one-third that of lead), relatively high specific heat, a specific gravity about one-fifth that of lead, and the elimination of calking. Automatic closing of leaks by a self-calking property of this filler offsets its one disadvantage of liability to initial leaks. With lead at 13c. per lb. the saving per mile of pipe is given as $565 for 6-in. to $5160 for 48-in. pipe.

This joint filler has been used on about 50 miles of pipe from 3 in. to 48 in. in diameter and subject to pressures as high as 115 lb. For pipe over 24 in. in diameter a bestolyte lining is inserted before the filler is poured. The metalium is the invention of Homer V. Krouse, constructing engineer for the Metropolitan Water District of Omaha.


CONTRACTING NEWS
OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS
AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Price advances are indicated by **heavy type**; declines by *italics*.

## IRON AND STEEL

**PIG IRON**—Below are the present quotations, with a comparison of a month and a year ago:

| | June 29, 1917 | One Month Ago | One Year Ago |
|---|---|---|---|
| CINCINNATI | | | |
| No. 2 Southern foundry | **$47.90** | $42.90 | $16.90 to 17.90 |
| No. 2 Northern foundry | .... | 43.00 | 19.76 to 20.76 |
| NEW YORK | | | |
| No. 2X Northern foundry | **50.25** | 45.75 to 46.25 | 19.75 to 20.25 |
| No. 2 plain Northern foundry | **49.25** | 45.25 to 45.75 | 19.50 to 20.00 |
| No. 2 Southern foundry† | **49.25** | 44.25 | 19.50 to 20.00 |
| BIRMINGHAM | | | |
| No. Southern foundry | **45.00** | 39.00 to 41.00 | 14.00 |
| CHICAGO | | | |
| No. 2 Northern foundry | **55.00** | 46.00 | 19.00 |
| PITTSBURGH | | | |
| Bessemer iron* | **55.95** | 45.95 | 21.95 |
| Basic iron* | **50.00** | 42.00 | 18.95 |

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater, New York.

**PIPE**—The following discounts are for carload lots f.o.b. Pittsburgh, as per basing card of May 1, 1917:

BUTT WELD

| Steel Inches | Black | Galvanized | Iron Inches | Black | Galvanized |
|---|---|---|---|---|---|
| ¾ to 3 | 49% | 35½% | ¾ to 1½ | 38% | 22% |

LAP WELD

| | | | | | |
|---|---|---|---|---|---|
| 2 | 42% | 29½% | 1¼ | 23% | 8% |
| 2½ to 6 | 45% | 32½% | 1½ | 30% | 16% |
| 7 to 12 | 42% | 28½% | 2 | 31% | 17% |
| 13 and 14 | 32½% | .... | 2½ to 4 | 33% | 20% |
| 15 | 30% | .... | 4½ to 6 | 33% | 20% |
| | | | 7 to 12 | 32% | 19% |

BUTT WELD, EXTRA STRONG PLAIN ENDS

| | | | | | |
|---|---|---|---|---|---|
| ¾ to 1½ | 47% | 34½% | ¾ to 1½ | 38% | 23% |
| 2 to 3 | 48% | 35½% | | | |

LAP WELD, EXTRA STRONG PLAIN ENDS

| | | | | | |
|---|---|---|---|---|---|
| 2 | 40% | 28½% | 1¼ | 24% | 9% |
| 2½ to 4 | 43% | 31½% | 1½ | 30% | 16% |
| 4½ to 6 | 42% | 30½% | 2 | 32% | 19% |
| 7 to 8 | 38% | 24½% | 2½ to 4 | 34% | 22% |
| 9 to 12 | 33% | 19½% | 4½ to 6 | 33% | 21% |
| | | | 7 to 8 | 27% | 15% |
| | | | 9 to 12 | 22% | 10% |

From warehouses at the places named the following discounts hold for steel pipe:

| Black | New York June 29, 1917 | New York One Year Ago | Chicago | St. Louis |
|---|---|---|---|---|
| ¾ to 3 in. butt welded | 38% | 61% | 43% | 41.27% |
| 3½ to 6 in. lap welded | 28% | 64% | 39% | 37.27% |

| Galvanized | New York June 29, 1917 | New York One Year Ago | Chicago | St. Louis |
|---|---|---|---|---|
| ¾ to 3 in. butt welded | 22% | 36% | 28% | 26.27% |
| 3½ to 6 in. lap welded | 10% | 42% | 25% | 22.27% |

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes, 34 and 5%.

**BARS, CONCRETE REINFORCING**—The following quotations are per 100 lb.:

ROLLED FROM BILLETS

| In. | Mill Shipment | New York June 29, 1917 | New York One Year Ago | St. Louis | Chicago | San Francisco | Dallas |
|---|---|---|---|---|---|---|---|
| ¾ and larger | * | **$5.10** | $3.10 | **$4.40** | $4.50 | **$5.00** | **$4.75** |
| ⅝ | * | **5.15** | 3.20 | **4.54** | 4.55 | **5.05** | **4.80** |
| ½ | * | **5.20** | 3.50 | **4.59** | 4.60 | **5.10** | **4.85** |
| ⅜ | * | **5.35** | 3.25 | **4.74** | 4.75 | **5.25** | **5.00** |
| ¼ | * | **5.60** | 3.85 | **4.99** | 5.00 | **5.50** | **5.25** |

*Mill quotations on actual specifications.

ROLLED FROM RAILS

| | St. Louis | Dallas | | St. Louis | Dallas |
|---|---|---|---|---|---|
| ¾ in. and larger | **$4.00** | **$4.75** | ⅜ in. | **$4.25** | **$5.00** |
| ⅝ | **4.05** | **4.80** | ¼ | **5.00** | **5.25** |
| ½ | **4.10** | **4.85** | | | |

**RIVETS**—The following quotations are per 100 lb.:

STRUCTURAL

| | Mill Pittsburgh | New York June 29, 1917 | New York One Year Ago | Chicago | St. Louis | Dallas |
|---|---|---|---|---|---|---|
| ¾ in. and larger | **$5.25** | **$7.00** | $4.00 | **$5.40** | $5.05 | .... |
| CONE HEAD BOILER | | | | | | |
| ¾ in. and larger | **5.35** | **7.10** | 4.10 | **5.50** | 5.15 | $8.25 |
| ⅝ and ⅞ | **5.50** | **7.25** | 4.25 | **5.65** | 5.30 | 8.40 |
| ½ and ⅝ | **5.85** | **7.60** | 4.60 | **6.00** | 5.65 | 8.70 |

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

**SHEETS**—Quotations are in cents per pound in various cities from warehouse, also the base quotation from mill:

| Blue Annealed | Large Lots, Pittsburgh | St. Louis | Chicago | San Francisco | New York June 29, 1917 | New York One Yr. Ago |
|---|---|---|---|---|---|---|
| No. 10 | **7.85** | **9.55** | **9.50** | **10.50** | **9.50** | 4.25 |
| No. 12 | **8.10** | **9.60** | **9.55** | **10.55** | **9.55** | 4.30 |
| No. 14 | **8.35** | **9.65** | **9.60** | **10.60** | **9.60** | 4.35 |
| Black | | | | | | |
| Nos. 18 and 20 | **8.05** | **9.15** | **9.30** | **10.80** | **9.80** | 3.45 |
| Nos. 22 and 24 | **8.10** | **9.20** | **9.35** | **10.83** | **9.85** | 3.50 |
| No. 26 | **8.15** | **9.25** | **9.40** | **10.88** | **9.90** | 3.55 |
| No. 28 | **8.25** | **9.35** | **9.50** | **10.98** | **10.00** | 3.65 |
| Galvanized | | | | | | |
| No. 10 | **9.00** | Premium | **9.75** | .... | .... | 4.50 |
| No. 12 | **9.10** | Premium | **9.85** | **12.15** | .... | 4.50 |
| No. 14 | **9.25** | Premium | **10.00** | **12.15** | **11.85** | 4.50 |
| Nos. 18 and 20 | **9.40** | Premium | **10.15** | **12.45** | **11.65** | 4.80 |
| Nos. 22 and 24 | **9.80** | Premium | **10.55** | **12.62** | **12.55** | 4.95 |
| No. 26 | **9.95** | Premium | **10.20** | **12.77** | **12.70** | 5.10 |
| No. 28 | **10.25** | Premium | **10.50** | **13.06** | **13.00** | 5.40 |

**STEEL RAILS**—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

| | Pittsburgh June 29, 1917 | Pittsburgh One Year Ago | Chicago June 29, 1917 | Chicago One Year Ago |
|---|---|---|---|---|
| Standard bessemer rails | $38.00 | $33.00 | $38.00 | $33.00 |
| Standard openhearth rails | 40.00 | 35.00 | 40.00 | 35.00 |
| Light rails, 8 to 10 lb. | 63.00 | 50.00 | **68.00** | 43.00 |
| Light rails, 12 to 14 lb. | 62.00 | 49.00 | **67.00** | 42.00 |
| Light rails, 25 to 45 lb. | 60.00 | 47.00 | **65.00** | 40.00 |

Note—Rerolled rails sell for same price as new light rails.

**TRACK SUPPLIES**—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

| | Pittsburgh June 29, 1917 | Pittsburgh One Year Ago | Chicago | St. Louis | San Francisco |
|---|---|---|---|---|---|
| Standard railroad spikes | **$4.50** | $2.65 | $5.00 | $4.85 | **$5.75** |
| Track bolts | **6.25** | 3.25 | 6.25 | 5.05 | **7.50** |
| Standard section angle bars | ... | 2.00 | 4.00 | Premium | ... |

**NAILS**—The following quotations are per keg from warehouse:

| | Pittsburgh | St. Louis | San Francisco | Dallas |
|---|---|---|---|---|
| Wire | **$4.00** | **$4.50** | $4.60 | $4.25 |
| Cut | 4.65 | **5.00** | 6.15 | .... |

**STRUCTURAL MATERIAL**—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

| | Pittsburgh | New York June 29, 1917 | New York 1 Yr. Ago | St. Louis | Chicago | San Francisco | Dallas |
|---|---|---|---|---|---|---|---|
| Beams, 3 to 15 in. | *$1.50* | **$5.25** | **$3.25** | $5.05 | $5.00 | **$7.75** | **$6.00** |
| Channels, 3 to 15 in. | *1.60* | **5.25** | 3.25 | 5.05 | 5.00 | **7.75** | 6.00 |
| Angles, 3 to 6 in., ¼ in. thick | *1.50* | **5.25** | 3.25 | 5.05 | 5.00 | **7.75** | 6.00 |
| Tees, 3 in. and larger | *1.50* | **5.30** | 3.30 | 5.05 | 5.00 | **7.75** | 6.00 |
| Plates | **9.00*** | **9.00** | 4.00 | 6.55 | 7.00 | **10.00** | 9.00 |

*Price running wild. For prompt delivery from warehouse, $12.

New York extras on other shapes and sizes per lb. are as follows:

| | |
|---|---|
| I-beams over 15 in. | $0.10 |
| Angles over 6 in., on one or both legs | .10 |
| Angles, 3 in., on one or both legs, less than ¼ in. thick | .70 |
| Cutting to lengths, under 3 ft. to 2 ft. inclusive | .25 |
| Cutting to lengths, under 2 ft. to 1 ft. inclusive | .50 |
| Cutting to lengths, under 1 ft. | 1.55 |

No charge is made for cutting to lengths 3 ft. and over.

**WIRE ROPE**—Discounts from list price on regular grades of bright and galvanized are as follows:

| | New York June 29, 1917 | New York 1 Yr. Ago | St. Louis | Chicago |
|---|---|---|---|---|
| Galvanized | 10—2½% | 25—2½% | *10—2½%* | 10—2½% |
| Bright | 20—2½% | 35—2½% | *20—2½%* | 15—2½% |

**EXPANDED METAL LATH**—Prices per 100 yd. for painted are as follows:

| Gage | Weight | Carlod New York June 29, 1917 | Carlod New York One Year Ago | Chicago | St. Louis | Dallas |
|---|---|---|---|---|---|---|
| 27 | 233 | **$31.00** | **$16.00** | **$28.00** | **$30.00** | **$29.00** |
| 26 | 250 | 32.03 | 17.00 | 29.00 | 32.00 | .... |
| 25 | 300 | 33.13 | 18.00 | 30.00 | .... | .... |
| 24 | 340 | 34.25 | 19.00 | 31.00 | 35.00 | 33.00 |
| 22 | 450 | 36.44 | 22.00 | .... | .... | .... |

About 10% additional for smaller quantities.

**MANILA ROPE**—For rope smaller than ½-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½-in. and larger, in 1200-ft. coils:

| | | | |
|---|---|---|---|
| Boston | $0.32½ | Kansas City | $0.31½ |
| New York | .31¼ | New Orleans | .31 |
| Cincinnati | .29 | Los Angeles | .31½ |
| Denver | .34 | St. Paul | .31½ |

**CLAY DRAIN TILE**—The following prices are per 1000 lin.ft.:

| Size, In. | New York June 29, 1917 | New York One Year Ago | St. Louis | Chicago | San Francisco | Dallas |
|---|---|---|---|---|---|---|
| 3 | $35.00 | $22.50 | $18.40 | $15.00 | $24.00 | $19.80 |
| 4 | 51.00 | 32.50 | 20.70 | 18.00 | 31.50 | 28.10 |
| 5 | 65.00 | 47.50 | 28.75 | 23.00 | 45.50 | .... |
| 6 | 90.00 | 57.50 | 40.25 | 27.00 | 63.00 | 45.95 |
| 8 | 130.00 | 97.50 | 74.75 | 55.00 | 105.00 | 82.75 |

**WATER TREATMENT CHEMICALS**—Prices per lb. in New York are as follows:

| | |
|---|---|
| Sulphate of alumina (iron free) | $0.045 (in 400-lb. bbl.) |
| Hypochlorite of lime | .03 (in 700-lb. drums) |
| Soda ash | .04 (in 400-lb. bbl.) |
| Liquid chlorine | .175 f.o.b. Niagara Falls |

Lime is quoted separately, on next page.

**ASPHALTUM**—Price per ton in packages and bulk in carload lots:

| | Brand | Package | Bulk |
|---|---|---|---|
| New York | Texaco | $30.00 | .... |
| New York | Mexican | 19.00 | $14.00 |
| Chicago | Mexican | 24.00 | 20.00 |
| St. Louis | Texaco or Mexican | 22.50 | 19.50 |
| San Francisco | California | 14.50 | 12.00 |
| Dallas | Texaco and Mexican | 22.00 | .... |
| Denver | Trinidad | 45.00 | .... |
| Denver | California | 27.00 | .... |
| St. Paul | Trinidad | 25.40 | .... |

**SEWER PIPE**—The following prices are in cents per foot for carload lots:

| Size, In. | New York June 29, 1917 | New York One Year Ago | St. Louis | New Orleans | Denver | Los Angeles | Dallas |
|---|---|---|---|---|---|---|---|
| 3 | .111 | .07 | .... | .0448 | .075 | .055 | .096 |
| 4 | .111 | .07 | .... | .... | .... | .... | .096 |
| 5 | .1665 | .112 | .... | .07 | .16 | .09 | .144 |
| 6 | .1665 | .112 | .12 | .... | .... | .... | .144 |
| 8 | .255 | .154 | .165 | .1305 | .225 | .16 | .2125 |
| 10 | .3885 | .224 | .23 | .... | .... | .... | .2975 |
| 12 | .4995 | .28 | .33 | .2465 | .375 | .265 | .3825 |
| 15 | .666 | .278 | .50 | .... | .... | .... | .5525 |
| 18 | .925 | .532 | .75 | .... | .... | .... | .7225 |
| 20 | 1.11 | .63 | .90 | .... | .... | .... | .85 |
| 22 | 1.48 | .84 | 1.13 | .... | .... | .... | 1.105 |
| 24 | .665 | .91 | 1.28 | .975 | 1.25 | 1.00 | 1.275 |
| 27 | 2.47 | 1.62 | 1.30 | .... | .... | .... | .... |
| 30 | 2.736 | 1.98 | 1.70 | .... | .... | .... | .... |
| 33 | 3.60 | 2.57 | 2.25 | .... | .... | .... | .... |
| 36 | 4.10 | 2.87 | 2.50 | .... | 2.50 | .... | .... |

| | Kansas City | Cincinnati | Boston | St. Paul |
|---|---|---|---|---|
| 3 | .10 | .09 | .114 | .085 |
| 5 | .135 | .14 | .171 | .1325 |
| 8 | .18 | .2325 | .266 | .1325 |
| 12 | .36 | .44 | .513 | .32 |
| 24 | 1.35 | 1.88 | 1.71 | 1.15 |
| 36 | 3.25 | .... | 4.2025 | 3.00 |

**HOLLOW TILE**—Hollow building tile price per block in cents:

| | New York June 29, 1917 | New York One Year Ago | St. Louis | Dallas | New Orleans | Los Angeles |
|---|---|---|---|---|---|---|
| 4x12x12 | $0.0925 | $0.065 | $0.054 | $0.07 | $0.085 | $0.055 |
| 6x12x12 | .1295 | .091 | .066 | .09 | .... | .... |
| 8x12x12 | .15725 | .11 | .09 | .12 | .135 | .10 |
| 10x12x12 | .185 | .13 | .15 | .15 | .... | .... |
| 12x12x12 | .23125 | .1625 | .18 | .18 | .18 | .165 |

| | Denver | St. Paul | Kansas City | Cincinnati | Boston |
|---|---|---|---|---|---|
| 4x12x12 | .... | $0.056 | $0.0595 | $0.058 | $0.0957 |
| 8x12x12 | $9.00* | .104 | .1125 | .104 | .171 |
| 12x12x12 | .... | .14 | .1575 | .145 | .2266 |

*Ton.

**EXPLOSIVES**—Price per pound in small lots at cities named:

| | Low Freezing 20% | 40% | Gelatin 60% | 80% | Black Powder* | Fuse† |
|---|---|---|---|---|---|---|
| New York | .... | $0.24½ | $0.29½ | .... | .... | .... |
| Boston | .... | .... | .31¼ | .35 | .... | .... |
| Kansas City | $0.17 | .23½ | .28¼ | .34½ | .... | .... |
| New Orleans | .18¼ | .22¼ | .27¼ | .... | .... | .... |
| Los Angeles | .19 | .25 | .31½ | .... | .... | .... |
| St. Paul | .17 | .23¼ | .28¼ | .34½ | .... | .... |
| St. Louis | .14¼ | .20½ | .25½ | .31¾ | $1.85 | $5.80 |
| Denver | .16 | .20 | .25 | .33 | .... | .... |

*Price per keg. †1000 ft.

**ROAD OILS**—Following are prices in tank cars 8000 gal. minimum f.o.b. places named:

| | |
|---|---|
| New York, 40-50% asphalt | 6½c. gal. |
| New York, 60-70% asphalt | 7c. gal. |
| New York, dust layer | 7¼c. gal. |
| New York, binder | 8½c. gal. |
| St. Louis, asphalt | 5c. gal. |
| Dallas, 40-50% asphalt | 6c. gal. |
| Dallas, 60-70% asphalt | 7½c. gal. |
| San Francisco, 75-95% asphalt | $1.83 bbl. |

Note—Barrel or 42 bulk gal.

**WOOD BLOCK PAVING**—

| | Size of Block | Treatment | Per Sq. |
|---|---|---|---|
| New York | 3½ | 16 | $2.10 |
| New York | 4 | 16 | 2.20 |
| Chicago | 4 | 16 | 1.90 |
| Chicago | City specifications | | 2.00 |
| St. Louis | 3½ | 16 | 1.85 |
| Boston | 4 | 20 | 1.75 |
| Cincinnati | 4 | 16 | 1.90 |
| Kansas City | 4 | 16 | 1.85 |
| St. Paul | Minneapolis specifications | | 2.30 |

**LINSEED OIL**—These prices are per gallon:

| | New York June 29, 1917 | New York One Year Ago | Cleveland June 29, 1917 | Cleveland One Year Ago | Chicago June 29, 1917 | Chicago One Year Ago |
|---|---|---|---|---|---|---|
| Raw in barrels | $1.26 | $0.71 | $1.28 | $0.73 | $1.29 | $0.74 |
| 5-gal. cans | 1.36 | .81 | 1.38 | .83 | 1.34 | .84 |

**WHITE AND RED LEAD** in 500-lb. lots sell as follows in cents per pound:

| | Red June 29, 1917 Dry | Red June 29, 1917 In Oil | Red 1 Year Ago Dry | Red 1 Year Ago In Oil | White June 29, 1917 Dry and In Oil | White 1 Yr. Ago Dry and In Oil |
|---|---|---|---|---|---|---|
| 100-lb. keg | 13.25 | 13.50 | 10.50 | 11.00 | 13.00 | 10.50 |
| 25- and 50-lb. kegs | 13.50 | 13.50 | 10.75 | 11.25 | 13.25 | 10.75 |
| 12½-lb. keg | 13.75 | 14.00 | 11.00 | 11.50 | 13.50 | 11.00 |
| 1- to 5-lb. cans | 15.25 | 15.50 | 12.50 | 12.50 | 15.50 | 12.50 |

**ROOFING MATERIALS**—Prices per ton f.o.b. New York or Chicago:

| | Carload Lots | Less Than Carload Lots |
|---|---|---|
| Tar felt (14 lb. per square of 100 sq.ft.) | $59.00 | $60.00 |
| Tar pitch (in 400-lb. bbl.) | 15.00 | 17.00 |
| Asphalt pitch (in barrels) | 29.00 | 30.50 |
| Asphalt felt | 60.00 | 62.00 |

**PREPARED ROOFINGS**—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York and Chicago:

| | 1-Ply c.l. | 1-Ply l.c.l. | 2-Ply c.l. | 2-Ply l.c.l. | 3-Ply c.l. | 3-Ply l.c.l. |
|---|---|---|---|---|---|---|
| No. 1 grade | $1.15 | $1.30 | $1.45 | $1.60 | $1.75 | $1.90 |
| No. 2 grade | 1.00 | 1.15 | 1.25 | 1.40 | 1.50 | 1.65 |

Asbestos asphalt-saturated felt (14 lb. per square) costs $6.50 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quanties, in Philadelphia.

**LUMBER**—Price per M in carload lots:

Square Edge and Sound Green

Timbers 5 x 5

| | Southern Pine New York 20 Ft. and Under | Southern Pine New York 22-24 Ft. | Southern Pine Chicago 20 Ft. and Under | Southern Pine Chicago 22-24 Ft. | Yellow Pine St. Louis 20 Ft. and Under | Yellow Pine St. Louis 22-24 Ft. |
|---|---|---|---|---|---|---|
| 3x 4 to 8x 8 | $35.75 | $36.75 | $33.75 | $34.75 | $30.75 | $31.75 |
| 3x10 to 10x10 | 36.75 | 37.75 | 34.75 | 35.75 | 31.75 | 32.75 |
| 3x12 to 12x12 | 39.75 | 40.75 | 37.75 | 38.75 | 34.75 | 35.75 |
| 3x14 to 14x14 | 41.75 | 42.75 | 39.75 | 40.75 | 36.75 | 37.75 |
| 3x16 to 16x16 | 44.75 | 45.75 | 42.75 | 43.75 | 39.75 | 40.75 |
| 3x18 to 18x18 | 51.75 | 52.75 | 49.75 | 50.75 | 46.75 | 47.75 |
| 4x20 to 20x20 | 56.75 | 57.75 | 54.75 | 55.75 | 51.75 | 52.75 |

Over 32 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Prices from Lumberman's Bureau.

Yellow Pine—Dallas. Price per M:

| | |
|---|---|
| 2x4 to 2x12—12 to 16 ft. long | $32.50 |
| 2x4 to 2x12—10, 18 and 20 ft. long | 35.00 |
| 2x4 to 2x12—22 and 24 ft. long | 37.50 |
| 4x4, 4x6, 6x6, 8x8, 3x8 | 37.50 |
| 8x10, 10x10, 3x10 | 40.00 |
| 12x12, 3x12 | 40.00 |

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

| Size in Inches | 15 Ft. and Under | 16 to 24 Ft. | 25 to 32 Ft. |
|---|---|---|---|
| 3 and 4x4 | $20.00 | $21.50 | $22.50 |
| 3 and 4x6 and 8 | 20.00 | 20.50 | 21.50 |
| 6x6 to 8x8 | 20.50 | 21.50 | 21.50 |
| 3 and 4x10 | 20.00 | 21.50 | 22.50 |
| 6 and 8x10 | 21.00 | 22.00 | 22.00 |
| 10x10 | 21.00 | 21.00 | 23.00 |
| 3 and 4x12 | 20.00 | 21.50 | 22.50 |
| 6 and 8x12 | 21.50 | 22.50 | 22.50 |
| 10 and 12x12 | 21.00 | 21.00 | 23.00 |
| 3 and 4x14 | 21.00 | 23.00 | 24.00 |
| 6 and 8x14 | 22.50 | 23.50 | 23.50 |
| 7 and 9x14 | 23.50 | 24.50 | 24.50 |
| 10 and 12x14 | 22.00 | 22.00 | 24.50 |

| | 1-In. Rough, 10 In. x 16 Ft. and Under Y.P. | 1-In. Rough, 10 In. x 16 Ft. and Under Fir | 1-In. Rough, 10 In. x 16 Ft. and Under Hemlock | 2-In. T. and G. 10 In. x 16 Ft. Y.P. | 2-In. T. and G. 10 In. x 16 Ft. Fir |
|---|---|---|---|---|---|
| Cincinnati | $38.00 | .... | .... | $36.00 | .... |
| Kansas City | 43.25 | $44.50 | $43.50 | 43.00 | .... |
| Denver | .... | 34.00 | .... | .... | $39.00 |
| New Orleans | 38.00 | .... | .... | 30.00 | .... |
| St. Paul | .... | 51.00 | 33.50 | 59.00 | 37.50 |

| | 3 x 8-In. x 20 Ft. and Under Y.P. | Fir | Hemlock | Spruce | 12 x 12-In. 20 Ft. and Under Y.P. | Fir |
|---|---|---|---|---|---|---|
| Cincinnati | $36.00 | .... | .... | .... | $40.00 | .... |
| Kansas City | 38.00 | $35.00 | $35.00 | .... | 42.50 | $35.00 |
| Denver | .... | 40.00 | .... | 36.00 | .... | 44.00 |
| New Orleans | 26.00 | .... | .... | .... | 35.00 | .... |
| St. Paul | .... | 40.00 | 31.50 | 32.00 | .... | 45.00 |

**STEEL SHEET PILING**—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

| June 29, 1917 | One Month Ago | One Year Ago |
|---|---|---|
| $3.60 to 4.00 | $3.60 to 4.00 | $2.50 |

**CAST-IRON PIPE**—The following are prices per net ton for carload lots:

| | New York | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | June 29, 1917 | 1 Mo. Ago | One Yr. Ago | Birmingham | Chicago | St. Louis | San Francisco | Dallas |
| 4 in. | $68.50 | $58.50 | $34.00 | $58.00 | $68.50 | $67.00 | $72.60 | $68.00 |
| 6 in. and over | 65.60 | 55.50 | 31.00 | 55.00 | 65.50 | 64.00 | 69.30 | 65.00 |

Gas pipe and 16-ft. lengths are $1 per ton extra.

**OLD MATERIAL**—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and vicinity, the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

| | New York | |
|---|---|---|
| | June 29, 1917 | One Month Ago |
| Heavy melting steel scrap | $29.00 | $23.00 to 23.50 |
| No. 1 railroad wrought | 50.00 | 40.50 to 41.50 |
| Stove plate | 22.00 | 17.50 to 18.00 |
| No. 1 machinery cast | 35.00 | 29.00 to 30.00 |
| Machine shop turnings | 21.50 | 12.50 to 13.00 |
| Cast borings | 22.00 | 13.50 to 14.00 |
| Railroad mallelable cast | 32.00 | 24.00 to 24.50 |

| | Chicago | |
|---|---|---|
| | June 29, 1917 | One Month Ago |
| No. 1 railroad wrought | $44.00 | $36.00 to 37.00 |
| Stove plate | 24.50 | 18.00 to 19.00 |
| No. 1 machinery cast | 32.00 | 26.00 to 27.00 |
| Machine shop turnings | 20.00 | 14.50 to 15.00 |
| Cast borings | 19.50 | 14.00 to 14.50 |
| Railroad malleable cast | 35.00 | 26.50 to 27.00 |

| | St. Louis | |
|---|---|---|
| | June 29, 1917 | One Month Ago |
| Heavy melting steel scrap | $44.00 to 46.00* | $29.00 to 30.00* |
| No. 1 railroad wrought | 40.00 to 41.00 | 31.50 to 32.00 |
| Stove plate | 22.00 to 23.00 | 15.00 to 15.50 |
| No. 1 machinery cast | 30.00 to 31.00 | 21.50 to 22.00 |
| Machine shop turnings | 18.50 to 19.00 | 12.50 to 13.00 |
| Cast borings | 16.50 to 17.00 | 12.00 to 12.50 |
| Railroad malleable cast | 27.00 to 28.00 | 21.00 to 21.50 |

*Per gross ton.

**TRIANGLE MESH REINFORCEMENT**—Price per 100 sq.ft. in carload lots:

PLAIN 4-IN. x 4-IN. MESH

| Style Number | Sectional Area Square Inches per Foot Width | Pittsburgh | New York | Chicago | St. Louis | Dallas | San Francisco |
|---|---|---|---|---|---|---|---|
| 032 | 0.032 | $0.89 | $0.92 | $0.93 | $0.94 | $1.06 | $1.20 |
| 049 | 0.049 | 1.13 | 1.18 | 1.18 | 1.20 | 1.34 | 1.55 |
| 068 | 0.068 | 1.42 | 1.47 | 1.49 | 1.50 | 1.68 | 1.97 |
| 093 | 0.093 | 1.82 | 1.89 | 1.91 | 1.92 | 2.17 | 2.47 |
| 126 | 0.126 | 2.31 | 2.39 | 2.42 | 2.44 | 2.74 | 3.15 |
| 153 | 0.153 | 2.75 | 2.86 | 2.88 | 2.91 | 3.27 | 3.75 |
| 180 | 0.180 | 3.16 | 3.27 | 3.31 | 3.34 | 3.76 | ... |
| 245 | 0.245 | 4.17 | 4.33 | 4.36 | 4.41 | 4.96 | 6.12 |
| 287 | 0.287 | 4.82 | 5.00 | 5.04 | 5.10 | 5.72 | ... |
| 336 | 0.336 | 5.59 | 5.80 | 5.85 | 5.92 | 6.66 | ... |
| 395 | 0.395 | 6.48 | 6.72 | 6.78 | 6.86 | 7.73 | ... |

PLAIN 4-IN. x 8-IN. MESH

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 036P | 0.036 | .69 | .71 | .72 | .73 | .82 | ... |
| 053P | 0.053 | .97 | 1.01 | 1.02 | 1.03 | 1.16 | ... |
| 072P | 0.072 | 1.26 | 1.30 | 1.32 | 1.33 | 1.50 | ... |
| 097P | 0.097 | 1.62 | 1.68 | 1.70 | 1.71 | 1.93 | ... |
| 049R | 0.049 | .97 | 1.01 | 1.02 | 1.03 | 1.15 | 1.97 |
| 067R | 0.067 | 1.26 | 1.30 | 1.32 | 1.33 | 1.50 | ... |
| 089R | 0.089 | 1.62 | 1.68 | 1.70 | 1.71 | 1.93 | ... |

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.
Galvanized runs about 10% higher than plain.

**FREIGHT RATES**—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

| | | | |
|---|---|---|---|
| Baltimore | 15.4 | Minneapolis | 32.9 |
| Boston | 18.9 | New Orleans | 30.7 |
| Buffalo | 11.6 | New York | 16.9 |
| Chicago | 18.9 | Pacific Coast (all rail) | 75.0 |
| Cincinnati | 15.8 | Philadelphia | 15.9 |
| Cleveland | 10.5 | St. Louis | 23.6 |
| Denver | 68.6 | St. Paul | 32.9 |
| Kansas City | 43.6 | | |

## CEMENT, BRICK AND STONE

**PAVING STONE—**

| | | June 29, 1917 |
|---|---|---|
| New York | Manhattan | $2.50 sq.yd. |
| | Other boroughs | 2.25 sq.yd. |
| Chicago | About 4x8x4 dressed | 2.25 sq.yd. |
| | About 4x8x4 common | 1.80 sq.yd. |
| San Francisco | Basalt block 4x7x8 | 57.75 per M |
| Boston | 5-in. granite | 2.45 sq.yd. |
| Kansas City | Limestone | 2.00 sq.yd. |
| Cincinnati | Granite | 2.35 sq.yd. |
| St. Paul | Sandstone | 27.00 per M |

**FLAGGING—**

| | | June 29, 1917 |
|---|---|---|
| New York | Bronx | $0.17 sq.ft. |
| | Manhattan | .17 sq.ft. |
| | Queens, 5 ft. square | .18 sq.ft. |
| Chicago | 18 in. wide | .75 lin.ft. |

**CURBING**—Prices per linear foot are as follows:

| | | June 29, 1917 |
|---|---|---|
| New York | 5 x 16 | $0.40 |
| | 5 x 20 | .45 |
| Chicago | 6 x 18 | .60 |
| St. Louis | 5 x 16 square edge | .74 |
| | 5 x 16 bull nose | .80 |
| San Francisco | 5 x 16 | .75 |
| | 5 x 20 | .85 |

**SAND AND GRAVEL**—Price for cargo or carload lots is as follows, per cu.yd.:

| | Gravel | | | | | Sand | |
|---|---|---|---|---|---|---|---|
| | | 1½ In. | | ¾ In. | | | |
| | Paving | June 29, 1917 | One Yr. Ago | June 29, 1917 | One Yr. Ago | June 29, 1917 | One Yr. Ago |
| New York | $1.25 | $1.25 | $0.90 | $1.35 | $1.00 | $0.50 | $0.50 |
| Chicago | 1.40 | 1.40 | .85 | 1.40 | .85 | 1.00 | .85 |
| St. Louis | .... | 1.08 | .70 | 1.08 | .70 | 1.08 | .60 |
| Dallas | .... | 1.50 | .... | 1.50 | .... | 1.10 | .... |
| San Francisco | .... | .... | .75 | .... | .... | .... | .75 |
| New Orleans | .... | 1.85 | .... | 2.00 | .... | 1.25 | .... |
| Los Angeles | .... | .85 | .... | .85 | .... | .35 | .... |
| Denver | .... | 1.40 | .... | 1.40 | .... | .95 | .... |
| Kansas City | .... | 2.00 | .... | 2.25 | .... | .60 | .... |
| Boston | .... | 1.50 | .... | 1.55 | .... | .80 | .... |
| Cincinnati | .... | .90 | .... | .90 | .... | .90 | .... |
| St. Paul | .... | 1.00 | .... | 1.10 | .... | .50 | .... |

*Per ton

Fine White Sand—St. Louis:
Pacific.....$5.00 per ton Ottawa.....$7.00 per ton

**CRUSHED STONE**—Price for cargo or carload lots is as follows, per cu.yd.:

| | 1½ In. | | ¾ In. | |
|---|---|---|---|---|
| | June 29, 1917 | One Year Ago | June 29, 1917 | One Year Ago |
| New York | $1.10 | $0.85 | $1.25 | $0.95 |
| Chicago | 1.40 | 1.10 | 1.40 | 1.10 |
| St. Louis | 1.35 | 1.00 | 1.35 | 1.00 |
| Dallas | 1.42 | .... | .... | .... |
| New Orleans | 2.75 | .... | 4.00 | .... |
| Los Angeles | .95 | .... | 1.00 | .... |
| Denver | 1.40 | .... | 1.40 | .... |
| Kansas City | 1.50 | .... | 1.60 | .... |
| Boston | 1.40 | .... | 1.50 | .... |
| Cincinnati | 1.05 | .... | 1.05 | .... |
| St. Paul | .80 | .... | 1.00 | .... |

**LIME**—Warehouse prices:

| | Hydrated, per Ton | |
|---|---|---|
| | Finished | Common |
| New York | $16.50 | $13.25 |
| Chicago | 15.00 | 12.00 |
| St. Louis | 12.00 | 10.75 |
| Dallas | 20.00 | 15.00 |

**PORTLAND CEMENT**—These prices are for barrels in carload lots, including bags:

| | June 29, 1917 | One Month Ago | One Year Ago |
|---|---|---|---|
| New York | $2.22 | $2.22 | $1.72 |
| Jersey City | 2.16 | 2.16 | 1.66 |
| Boston | 2.27 | 2.27 | 1.92 |
| Chicago | 2.31 | 2.31 | 1.81 |
| Pittsburgh | 2.31 | 2.31 | 1.81 |
| Cleveland | 2.44 | 2.44 | 1.94 |
| Detroit | 2.40 | 2.40 | 1.90 |
| Indianapolis | 2.44 | 2.44 | 1.94 |
| Toledo | 2.44 | 2.44 | 1.94 |
| Milwaukee | 2.43 | 2.43 | 1.93 |
| Minneapolis | 2.58 | 2.58 | 2.08 |
| Duluth | 2.51 | 2.51 | 1.96 |
| Peoria | 2.43 | 2.43 | 1.89 |
| Cedar Rapids | 2.54 | 2.54 | 2.00 |
| Davenport | 2.49 | 2.49 | 1.90 |
| St. Louis | 2.45 | 2.45 | 1.86 |
| Denver | 2.39 | .... | .... |
| Dallas | 2.15 | 2.15 | .... |
| Los Angeles | 2.40 | 2.40 | .... |
| New Orleans | 2.56 | 2.70 | .... |
| Kansas City | 2.29 | 2.29 | .... |
| Cincinnati | 2.70 | 2.52 | .... |
| St. Paul | 2.63 | .... | .... |

**ROSENDALE NATURAL CEMENT**—Price to dealers for 500 bbl. or over, f.o.b., including bags:

| | |
|---|---|
| New York | $1.15 |

30c. allowed for bags.

**BRICK**—The price per 1000 in cargo or carload lots is as follows:

| | Common | | | Paving | |
|---|---|---|---|---|---|
| | June 29, 1917 | One Month Ago | One Year Ago | Brick | Block |
| New York | 9.00 to 9.50 | $10.25 | $8.00 | $25.00 | $35.00 |
| Chicago | 8.00 | 8.00 | 6.25 | 16.75 | 24.00 |
| St. Louis, salmon | 7.00 | 7.00 | 6.00 | .... | 18.00 |
| St. Louis, selected red | 10.00 | 10.00 | 9.50 | .... | .... |
| Dallas | 8.10 | 8.10 | .... | 22.00 | 22.50 |
| New Orleans | 9.00 | 9.00 | .... | .... | .... |
| Kansas City | 11.00 | 10.00 | .... | .... | 20.00 |
| Los Angeles | 7.50 | 7.50 | .... | .... | 28.00 |
| Boston | 13.25 | 12.50 | .... | .... | 25.00 |
| Denver | 8.00 | .... | .... | .... | .... |
| Cincinnati | 13.50 | 9.50 | .... | .... | 22.50 |

## MISCELLANEOUS

**RAILWAY TIES**—For fair-size orders, the following prices per tie hold:

| | Material | 6 In. x 8 in. by 8 Ft. | 7 In. x 9 in. by 8 Ft. 6 In. |
|---|---|---|---|
| New York | Yellow Pine | $1.06 to 1.11 | $1.25 |
| St. Louis | White Oak | 1.00 | .75 |
| Chicago | Green | .85 | .97 |
| San Francisco | Creosoted | 1.18 | 1.60 |

**CORRUGATED SHEETS**—Price of corrugated sheets (2½-in. corrugations) in cents per pound:

| Gage | | Cincinnati | Birmingham | St. Louis | Denver |
|---|---|---|---|---|---|
| 18–20 | Black | $18.00* | .... | $0.092 | .... |
| 28 | Black | 5.75* | .... | .094 | $0.10 |
| 10 | Galvanized | .... | .... | .... | .... |
| 18–20 | Galvanized | 22.50* | $0.11 | .... | .... |
| 28 | Galvanized | 8.75* | .12 | .113 | .12 |

*Price per square of 100 sq.ft.

# Proposals

**For Proposals Advertised See Pages 64 to 71 Inclusive**

## WATER-WORKS

| Bids Close | | See Eng. News-Record |
|---|---|---|
| July 10. | Duluth, Minn. | June 14 |
| July 10. | New York, N. Y. Adv. June 14 and Adv. to 28. | June 21 |
| July 10. | Newark, N. J. | July 5 |
| July 12. | Cuba City, Wis. Adv. June 14 to 28 and July 5. | June 28 |
| July 12. | Casper, Wyo. | July 5 |
| July 17. | New York, N. Y. Adv. June 7 to 28 and July 5. | June 14 |

## SEWERS

| | | |
|---|---|---|
| July 9. | Brooklyn, N. Y. | June 28 |
| July 9. | St. Paul, Minn. | July 5 |
| July 9. | Neodesha, Kan. | July 5 |
| July 10. | Beloit, Wis. | June 28 |
| July 10. | Spirit Lake, Ia. | June 28 |
| July 11. | Huntington, W. Va. | July 5 |
| July 11. | Mexico, Mo. | July 5 |
| July 12. | Bridgeport, Conn. Adv. June 14 to 28. | June 14 |
| July 12. | Neenah, Wis. | June 28 |
| July 12. | Cleveland, O. Adv. June 28. | July 5 |
| July 23. | Wingdale, N. Y. Adv. June 28 and July 5. | June 28 |
| July 31. | Linndale, O. | July 5 |

## STRUCTURAL STEEL WORK

| | | |
|---|---|---|
| July 9. | Salem, N. J. | June 28 |
| July 9. | Olympia, Wash. | June 28 |
| July 10. | La Grange, Tex. | June 28 |
| July 10. | Vincennes, Ind. | June 28 |
| July 13. | Lansing, Mich. | June 28 |
| July 15. | Orange, Tex. Adv. June 7 to 21 | June 7 |
| July 17. | West Palm Beach, Fla. Adv. June 21. | June 21 |
| Aug. 2. | Miami, Fla. Adv. June 28 and July 5. | June 28 |

## REINFORCED CONCRETE

| | | |
|---|---|---|
| July 9. | Alexandria, Minn. | June 28 |
| July 9. | Barberton, O. | June 28 |
| July 9. | Camden, N. J. Adv. June 28 and July 5. | June 28 |
| July 9. | Cornwall, Sask. | July 5 |
| July 10. | Montezuma, Ga. | June 21 |
| July 10. | Red Bluff, Cal. | July 5 |
| July 11. | Wilmington, Del. | July 5 |
| July 13. | Palo Alto, Cal. | July 5 |
| July 13. | Regina, Sask. | July 5 |
| July 13. | Elgin, Ill. | July 5 |
| July 14. | Quincy, Ill. | July 5 |
| July 15. | Kansas City, Kan. | June 28 |
| July 16. | Berkeley Springs, W. Va. | June 28 |
| July 17. | Geneva, Neb. | June 28 |
| July 17. | New Brunswick, N. J. Adv. June 28 and July 5. | June 28 |
| July 30. | Watsontown, Pa. | July 5 |

## STREETS AND ROADS

| | | |
|---|---|---|
| July 7. | Selma, Ala. | June 28 |
| July 9. | Winfield, W. Va. Adv. June 14. | June 21 |
| July 9. | Albany, N. Y. Adv. June 21 and 28 and July 5. | June 21 |
| July 9. | East View, O. | June 28 |
| July 9. | Clarksburg, W. Va. | June 28 |
| July 9. | Chaska, Minn. | July 5 |
| July 9. | Amite, La. | July 5 |
| July 9. | Casper, Wyo. | July 5 |
| July 9. | Carlton, Minn. | July 5 |
| July 9. | Indianapolis, Ind. | July 5 |
| July 9. | Duluth, Minn. | July 5 |
| July 9. | Kentwood, La. | July 5 |
| July 9. | Yuba City, Cal. | July 5 |
| July 9. | Madison, Wis. | July 5 |
| July 9. | Newark, O. | July 5 |
| July 9. | Louisville, Ky. | July 5 |
| July 10. | Putnam, Va. Adv. June 28 and July 5. | June 21 |
| July 10. | Erwin, Tenn. | June 21 |
| July 10. | Aberdeen, Miss. | June 21 |
| July 10. | West New York, N. J. | June 28 |
| July 10. | Rockville, Md. Adv. June 21 and 28 and July 5. | June 28 |
| July 10. | Uniontown, Pa. | July 5 |
| July 10. | Jersey City, N. J. | July 5 |
| July 10. | Massachusetts | July 5 |
| July 10. | La Grange, Tex. | July 5 |
| July 11. | Washington, Pa. | June 28 |
| July 11. | Mt. Holly, N. J. Adv. June 28. | June 28 |
| July 11. | Huntington, W. Va. | July 5 |
| July 12. | Olean, N. Y. Adv. June 28. | June 28 |
| July 12. | Newark, N. J. | June 28 |
| July 12. | Cedar Grove, N. J. | July 5 |
| July 12. | Elizabeth, N. J. | July 5 |
| July 13. | Walla Walla, Wash. | July 5 |
| July 13. | Cincinnati, O. | July 28 |
| July 13. | Cincinnati, O. | July 5 |
| July 14. | Indiana | June 14 |
| July 14. | Pine Bluff, Ark. | June 28 |
| July 14. | Lincoln, Neb. | July 5 |
| July 14. | Rochester, Ind. | July 5 |
| July 16. | California | June 28 |
| July 18. | Belvidere, N. J. Adv. June 28 and July 5. | June 28 |
| July 16. | Everett, Wash. | July 5 |
| July 16. | Port Orchard, Wash. | July 5 |
| July 18. | Hawthorne, N. J. | July 5 |
| July 19. | Flemington, N. J. | June 28 |
| July 21. | Wauseon, O. | July 5 |
| July 24. | Pennsylvania | June 28 |
| July 25. | Idaho | July 5 |
| Aug. 13. | Lewiston, Idaho | May 24 |

## INDUSTRIAL WORKS

| | | |
|---|---|---|
| Aug. 1. | St. Petersburg, Fla. | July 5 |

## EXCAVATION AND DREDGING

| | | |
|---|---|---|
| July 7. | Wadena, Minn. | July 5 |
| July 10. | Fowler, Ind. | July 5 |
| July 10. | Indianola, Ia. | July 5 |
| July 10. | Spencer, Ia. | July 5 |
| July 10. | Jefferson, Ia. | July 5 |
| July 10. | Redwood Falls, Minn. | July 5 |
| July 12. | Madison, S. D. | June 28 |
| July 12. | Boone, Ia. | June 28 |
| July 12. | Redwood Falls, Minn. | June 28 |
| July 14. | Cambridge, Minn. | July 5 |
| July 14. | Huntington, Tenn. | July 5 |
| July 14. | Mankato, Minn. | July 5 |
| July 16. | Hanna, Ill. Adv. June 28 and July 5. | June 28 |
| July 16. | Lake Shore (Spanish Fork Post Office) | July 5 |
| July 18. | Glenwood, Ia. | June 21 |
| July 19. | Greenville, Miss. Adv. June 21 and 28. | June 28 |
| July 20. | St. Cloud, Minn. | June 21 |
| July 21. | Kankakee, Ill. | July 5 |
| July 24. | Slayton, Minn. | July 5 |
| July 27. | Detroit, Mich. | July 5 |

## BUILDINGS

| | | |
|---|---|---|
| July 9. | Cleveland, O. | June 14 |
| July 9. | Alliance, O. | July 5 |
| July 9. | St. Peter, Minn. | July 5 |
| July 10. | Almont, N. D. | June 28 |
| July 10. | Rocky River, O. | June 28 |
| July 10. | Huron, S. D. | June 21 |
| July 10. | Bronson,, Ia. | July 5 |
| July 10. | Yonkers, N. Y. | July 5 |
| July 11. | Terre Haute, Ind. | July 5 |
| July 12. | Philadelphia, Pa. Adv. June 21 and 28 and July 5. | June 28 |
| July 16. | Great Bend, Kan. | June 28 |
| July 16. | Cresco, Ia. | July 5 |
| July 18. | Concordia, Kan. | June 28 |
| July 19. | Shenandoah, Ia. | June 28 |
| July 20. | Akron, O. | July 5 |
| July 21. | Martins Ferry, O. | July 5 |
| July 21. | Livingston, Mont. | July 5 |
| July 23. | Columbus Jct., Ia. | June 28 |
| July 30. | Ft. Wayne, Ind. | June 28 |
| July 31. | Ft. Wayne, Ind. | July 5 |

## FEDERAL GOVERNMENT WORK

| Bids Close | | See Eng. News-Record |
|---|---|---|
| July 9. | Glenwood, Ia. Adv. June 21 and 28. | June |
| July 9. | Annapolis, Md. | June |
| Aug. 9. | Du Bois, Pa. Adv. June 28 and July 5. | June |
| July 9. | New London, Conn. | July |
| July 10. | Buffalo, N. Y. Adv. June 14 to 28. | June |
| July 10. | Buffalo, N. Y. Adv. June 28 and July 5. | June |
| July 10. | Washington, D. C. Adv. June 21 and 28 and July | June |
| July 11. | Vicksburg, Miss. Adv. June 21 and 28 and July | June |
| July 12. | Hoopeston, Ill. | June |
| July 13. | Columbus, S. C. | July |
| July 16. | Newburyport, Mass. | June |
| July 16. | Charleston, W. Va. | June |
| July 16. | Dover, N. J. | July |
| July 16. | St. Louis, Mo. | July |
| July 18. | St. Ignatius, Mont. Adv. June 21. | June |
| July 20. | Ft. Fairfield, Me. | June |
| July 23. | Cincinnati, O. Adv. June 21 and 28 and July 5. | June |
| July 25. | Cherokee, Okla. | July |
| July 26. | Gallatin, Tenn. Adv. June 21 and 28. | June |
| July 27. | Vernon, Tex. | June |
| July 31. | Chardon, Neb. | July |
| Aug. 3. | Winchester, Mass. | July |
| Aug. 6. | Globe, Ariz. | July |

## MISCELLANEOUS

| | | |
|---|---|---|
| July 9. | Marble Wainscoating—Media, Pa. | June |
| July 12. | Refrigerating Equipment—Thiells, N. Y. Adv. June 21 and 28. | June |
| July 13. | Freight Conveyors—Albany, N. Y. Adv. June 21 and 28 and July 5. | June |
| July 13. | Fire Towers, Trenton, N. J. Adv. July 5. | July |
| July 18. | Incinerator, Outremont, Que. | July |

**Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.**

## WATER-WORKS

### Proposed Work

**N. Y., Westfield**—Boro. plans rebuilding water system. About $80,000. C. C. Westfield, boro. and des. engr. Gannet, Seelye & Fleming, 204 Locust St., Harrisburg, cons. engrs. Noted Apr. 12.

**N. J., Summit** — City plans to install storm water system involving about 4 mi. 10- to 54-in. pipe. R. C. Wheeler, city engr.

**Va., Petersburg**—City will install filtration plant and pump made necessary by cantonment camp to be built here. About $25,000. R. D. Budd, city engr.

**W. Va., Martinsburg**—City extending water mains and installing electric pumps. J. H. Zicker, recdr.

**O., Canton**—City plans to issue $80,000 bonds to improve water system. L. B. Ohliger, supt.

**O., Greenville**—City plans new waterworks system. G. A. Johnson, 150 Nassau St., New York, cons. engr. Noted May 24.

**Ill., Chicago**—Plans being prepared by Engr. Dept. for new pumping station and 3 mi. water tunnel to connect with present Roseland tunnel at State St. in southwest section of city. About $3,000,000. J. Ericson, city engr.

**Ia., Arlington**—City voted $18,000 bonds to install water system. J. T. Wiltsie, supt.

**Neb., Mitchell**—City voted $11,000 bonds for water works improvements. Address City Clk.

Water-Works (Continued)

**Neb., Scottsbluff**—City will hold election to vote on $22,000 bonds for water works extensions. O. F. Finley, city engr. Noted Apr. 12.

**Tex., Port Arthur**—City soon lets contract extending water and sewerage systems. About $180,000. D. K. Miller, supt. and engr.

**Okla., Bartlesville**—City will issue $50,000 bonds for water works improvements. A. C. Easter, mayor.

**Okla., Okmulgee**—City plans election to vote on $53,000 bonds for water-works. Address City Clk.

**Cal., McKittrick**—Producers' Transportation Co., Union Bldg., Los Angeles, plans to lay 30 mi. of 4- and 6-in. water mains.

**BIDS DESIRED**

**N. J., Newark**—Until July 10, by Passaic Valley Sewerage Comrs. for foundations and connections for Wallington pumping station.

**Kan., Chanute**—(Official)—Until July 17, by G. G. Wood, city clk., for improving water-works. Black & Veatch, 507 Inter-State Bldg., Kansas City, Mo., cons. engrs.

**Kan., Pittsburg**—Until July 11, by L. Boyd, clk., for 1 6,000,000-gal. turbine-driven centrifugal pump and 1 4,000,000-gal. crank and flywheel pump.

**Wyo., Casper**—Until July 12, by C. M. Bryan, city clk., for 9900 ft. 12-in., 4800 ft. 8-in., 5400 ft. 6-in. and 900 ft. 4-in. water mains, also valves, hydrants, etc. L. S. Worthington, city engr.

**PRICES AND CONTRACTS AWARDED**

(★Indicates award of contract)

★**Wis., Osceola**—City let contract water-works and sewerage systems to W. C. Frazer, 507 Germania Bldg., about $30,000; reservoir to Johnson & Drake, 705 Plymouth Bldg., Minneapolis, $4426.

**Minn., Ely**—See "Sewers."

★**Kan., Garden City**—(Official)—City let contract distribution system to Wheeler, Kelcher & Co., Garden City, transmission system to H. W. Otto, Garden City, pumps to American Mill Wks., 112 North Broadway, Aurora, Ill. Noted May 10.

**Ark., Fayetteville**—Water Comn. let contract filtration plant to Blodgett Constr. Co., Shreveport, La. About $34,000. Noted Apr. 10.

★**Ark., Stuttgart**—City let contract storm water brick conduit to carry off surface water to J. McCoppin, 2400 Arch St. About $29,700.

## SEWERS

**N. Y., Lancaster** — City voted $35,000 bonds for sewer and water extensions. Address City Clk.

**N. J., Summit**—City plans to extend and enlarge storm water sewerage system, including repaving of temporary and semi-permanent pavements with permanent pavements, to cover a period of about 4 years. R. C. Wheeler, city engr.

**Ky., Owensboro**—City will issue $250,000 bonds for sewer construction. H. Talbother, city engr. Noted May 24.

**O., Lorain**—City plans sanitary sewer in portions of East 27th St. C. M. Osborne, city engr.

**O., Sidney**—City will issue $20,700 bonds for constructing sewers in various streets. A. F. Johnston, city engr.

**Ind., Muncie**—(Official)—City soon lets contract 6927 ft. 72-in. segment block sewer, 1754 ft. 48-in. brick sewer, 2412 ft. 36-in. cement pipe and 2378 ft. 15- and 20-in. tile. B. F. Deardorff, city engr.

**Ind., South Bend**—Bd. Pub. Wks. plans to install pipe sewers portion Chapin, Garst, Kendall, Leer and Dayton Sts., also Catalpa Ave. F. J. Anderson, city engr.

**Mich., Lansing** — City plans to install sewer in portion of Clayton St. H. W. Sparks, city engr.

**Ill., Evanston**—Bd. Local Improv. plans to spend $80,000 to install sewer from Williamette to Sanitary Dist. Canal. J. I. Bromer, pres.

**Minn., Dodge Center**—City will install sewerage system. J. F. Druar, 312 Commercial Bldg., St. Paul, preparing plans.

**Kan., Wichita**—City plans sewerage system in northern section. About $250,000. B. C. Wells, city engr.

**Tex., Port Arthur**—City soon lets contract for 56,000 ft. 8-in. vit. sewer pipe, 13,000 ft. of 10-in., 7000 ft. 12-in., 6000 ft. 15-in., 5000-ft. c.-i. force mains, 80 manholes, 125 clean-outs, 1 ejector station, 1 pump and collector well.

**Okla., Sand Springs**—See "Streets and Roads."

**BIDS DESIRED**

**W. Va., Huntington**—Until July 11 by City Comrs. for constructing 2 mi. 10- and 12-in. sewers. A. B. Mupin, city engr.

**O., Cleveland**—(Official)—Until July 12, by E. Shattuck, comr. purchases and supplies, building submerged outfall pipe, channel, etc., at sewage treatment works, etc.; advertised in this issue.

**O., Linndale**—(Official)—Until July 31, by A. L. Wurstner, clk., for sewers in Grand, Peeler and Snow Aves., and Park and Columbia Sts. J. B. Davis & Son, 876 The Arcade, Cleveland, village engrs. Noted June 28.

**Minn., St. Paul**—Until July 9, by H. W. Austin, purch. agt. for sewers in portion of Palace and Clarence Sts. and Berkeley Ave. O. Claussen, city engr.

**Kan., Neodesha**—Until July 9, by J. J. Carroll, city clk., for installing storm sewers.

**Mo., Mexico**—Until July 11, by city for installing sewage disposal plant. No bids received June 20. W. Dearing, city clk.

**PRICES AND CONTRACTS AWARDED**

(★Indicates award of contract)

★**N. J., Newark**—Passaic Valley Sewerage Comn. let contract generating sets at Newark Bay pumping station to J. W. Hooley, New York City, $22,579. Noted May 31.

**N. J., Newark**—Passaic Valley Sewerage Comn. received low bids, June 19, connections, etc., at Yantacaw pumping station, from J. F. Shanley Co., 26 Exchange Pl., Jersey City, $93,675; L. L. Brom Co., New York City, $93,914; O'Gara Constr. Co., 127 Frelinghuysen Ave., $96,720. Noted May 24.

**N. J., Newark**—Passaic Valley Sewerage Comrs. received lowest bid outfall pressure tunnel under Jersey City and New York Bay from C. A. Haskin, Boston. About $2,391,000. Noted May 10.

★**N. J., Newark**—Passaic Valley Sewerage Comrs. let contract Kearney-Harrison branch intercepting sewer to Harrison & Craig, 1837 Broad St. About $104,662. Noted June 28.

**Tenn., Cleveland** — See "Streets and Roads."

★**O., Cincinnati**—(Official)—City let contract installing sewers from Baltimore and Carl St. to Yoast St. to M. J. Connelly & Co., 636 West 8th St., $25,894.

★**Ill., Cambridge**—Town let contact sewage disposal plant to P. Schlachter, 609 East Hickory St., Streator, $10,000.

★**Ill., Lombard** — (Official) — Bd. Local Improv. let contract installing sewers and sewage treatment plant to Gedney & Murphy, 612 Globe Bldg., Minneapolis, $172,397. Noted June 7.

**Mich., Ann Arbor**—(Official)—City received low bid storm and sanitary sewers from W. Eddy & Son. M. Osgood, city engr.

★**Ill., Rock Island** — See "Streets and Roads."

★**Wis., Hillsboro** — Village let contract furnishing and laying vitr. pipe sewers to Brogan & Burns, Green Bay, $12,490. Noted June 14.

★**Wis., Osceola**—See "Waterworks."

★**Ia., Cedar Rapids**—Mound Farm Real Estate Co. le. contract 6- and 10-in. sewers to J. B. Ford & Son.

★**Ia., Creston**—City let contract sewage-disposal plant to Morrison Constr. Co., 318 Hubbell St., Des Moines; outfall sewer extension to Akin & Flutter, Corning, $1.10 per ft. Noted June 14.

★**Ia., Early**—City let contract installing sewers to C. A. Dobson Co., Lincoln, Neb. About $25,311.

★**Ia., Marshalltown** — City let contract for storm sewer to A. Carlson, Marshalltown. About $29,000. Noted Apr. 5.

**Minn., Ely**—City received low bid installing storm and sanitary sewers and water mains from Pastoret Constr. Co., 511 Lyceum Bldg., Duluth, about $30,000.

★**Neb., Omaha**—City let contract storm sewer in portions of 37th St. to Nebraska Constr. Co., $57,000.

★**S. D., Sioux Falls**—City let contract West Morningside sewer to Cady & Savonell. $30,000.

★**Ark., Stuttgart**—City let contract brick storm water sewer to J. McCoppin, 2400 Arch St., Little Rock, $29,700. Noted June 28.

★**Ariz., Yuma**—City let contract sewers Dist. No. 2 to C. H. Julian, San Diego, Cal. About $37,058.

## STRUCTURAL STEEL WORK

**Proposed Work**

**Pa., Pittsburgh**—Supervs. Allegheny and Beaver Cos. rejected bids opened June 22, extending inter-county bridge No. 1 over Sewickley Creek, Fair Oaks Sta. Noted June 14.

**Va., Metomkin** — Washington-Newport News Short Line will build bridge over Potomac River from Metomkin to Riverside, Md.; double leaf bascule drawbridge, draw 300 ft. wide, truss and girder approaches. F. S. Gannon, 55 Liberty St., New York City, pres.

**Ind., Brazil**—County appropriated $35,000 for new bridge over Eel River to replace one destroyed by flood. A. Graeser, co. aud.

**Wis., Madison**—See "Streets and Roads."

**Ia., Grundy Center**—Bd. Superv. will spend about $20,000 for bridge work during year. Address co. engr.

**Tex., Dallas** — (South Dallas) — City Comrs. appropriated $29,000 to complete approach to Forest Ave. bridge. County will appropriate $8000 toward work. Address O. H. Land, comr.

**Okla., Coalgate** — See "Streets and Roads."

**Wash., South Bend**—See "Streets and Roads."

**BIDS DESIRED**

**La., Amite**—See "Streets and Roads."

**Ind., Vincennes**—Until July 10 by Co. Comrs. rebuilding and repairing following bridges, Martha Utt, William Kyle, G. W. Hill, Roll Horn, William Menk, William Theriac, Taylor Moran, Toney Frey, Nugent, Enmeier and Gayhart box culvert. J. I. Muentzer, aud.

**O., Miamisburg**—(Official)—Until July 16 by W. H. Aszling, co. clk., Dayton, for steel superstructure for bridge No. 248 over Great Miami River.

**Cal., Red Bluff**—See "Reinforced Concrete."

**PRICES AND CONTRACTS AWARDED**

(★Indicates award of contract)

★**Miss., Yazoo City**—Bd. Superv. Let contract steel and concrete bridges in Beat No. 3 to Scruggs Co. of Alabama, about $20,000. Noted Apr. 26.

**Minn., Detroit**—See "Excavation and Dredging."

★**Minn., New Ulm**—Superv. Brown and Renville Cos. let contract bridge over Minnesota River to connect state roads between 2 counties to Waddell & Hohley, Minneapolis. Noted May 24.

**Mont., Rexford** — County let contract bridge to Coast Bridge Co., Ry. Ex. Bldg., Portland. About $30,000.

★**Wash., Olympia**—State Highway Comn. let contract building Coweman River bridge to Monson Constr. Co., Portland, $18,427. Noted June 7.

★**Cal., Nicolaus** — County let contract superstructure bridge over Feather River to Clinton Constr. Co., 21st and Treat Sts., San Francisco, $54,250. Noted June 21.

## REINFORCED CONCRETE

### Proposed Work

**Mass., Boston**—St. Marys Trust plans 2-story, 70 x 180-ft. rein.-con. garage, Commonwealth Ave. and St. Marys St. About $180,000. H. G. King, 185 Devonshire St., sec.

**N. J., Newark**—Citizens' Advisory Com. plans 2- and 3-story rein.-con. boys' vocational school, Sussex Ave., between 1st and 2nd Sts. Bd. Educ. appropriated $206,700 for work. L. Sonntag, City Hall, act. superv. archt.

**Pa., Montgomery** — County will build rein.-con. bridge over west branch of Susquehanna River at foot 2nd St. M. C. Krause, co. cons. engr.

**Pa., Phila.**—Dept. Wharves, Docks and Ferries will soon let contract for rein.-con. pier at foot Kenilworth St.; about 550 ft. long and 120-ft. wide. G. S. Webster, 550 Bourse Bldg., Dir. Noted Mar. 1.

**Fla., Bradentown**—County will hold election Aug. 1 to vote on $60,000 bonds for rein.-con. bridge over Manatee River between Bradentown and Palmetto.

**Ill., Rock Island**—Illinois Oil Co., 1517 3rd Ave., plans 3-story, rein.-con. warehouse, 24th St. and 4th Ave. About $50,000.

**Wis., Kenosha**—Winther Motor Co. plans 1-story, 100 x 500-ft. rein.-con. and steel plant. About $100,000. M. P. Winther, pres.

**Wis., Milwaukee** — Store and Office — Globe Investment Co. plans rein.-con. and steel, Grand Ave., between West Water and 2nd Sts. About $100,000. Kirchoff & Rose, Majestic Bldg., archts.

**Kan., Parsons**—County will build bridge over Labette Creek on Main St., 2 con. arches about 75 ft. long with roadway from 20 to 24 ft. wide. About $12,000. W. J. King, co. engr.

**Tex., Huntsville** — See "Streets and Roads."

**Cal., San Francisco**—Fleishacker Paper Box Co., plans 4-story, 123 x 130-ft. rein.-con. factory, 2nd and Harrison Sts. About $125,000.

### BIDS DESIRED

**Pa., Watsontown**—(Official)—Until July 30, by J. C. Tressler, co. clk., Sunbury, for rein.-con. bridge over west branch Susquehanna River between Watsontown and White Deer. M. J. Flynn, co. engr.

**N. C., Wilmington**—Until July 11 by Cape Fear Packing Co., for 4-story, 60 x 180-ft. rein.-con. packing plant. G. H. Smith, pres. Wilson & Sompayrac, Columbia, S. C., archts. Noted May 31.

**Ill., Elgin**—(Official)—Until July 13, by M. H. Brightman, city engr., concrete slab bridge over Fox River on Kimball St. G. A. P. Turner, Walker Burton Bldg., Minneapolis, cons. engr. Noted June 14 under "Structural Steel."

**Ill., Quincy** — (Official) — Until July 14, by L. L. Boyer, co. supt. highways, for 14 rein.-con. bridges. About $12,500. Noted June 21 under "Structural Steel."

**Ia., Spencer** — See "Excavation and Dredging."

**Cal., Red Bluff**—Until July 10th by H. G. Kuhn, co. clk., building rein.-con. subway under Southern Pacific tracks on State Highway, also bridge over Red Bank Creek.

**Ont., Cornwall**—Until July 9th by A. I. MacDonald, co. clk., building 14 rein.-con. bridges on Highway system of United counties of Stormont, Dundas and Glengary, E. Merkley, chn. rd. com.

**Sask., Regina**—Until July 13th by H. S. Carpenter, deputy minister of highways, building 2 rein.-con. arch bridges over Arm and Qu' Appelle Rivers.

### PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Camden**—Victor Talking Machine Co., Front and Cooper Sts., let contract 1-story rein.-con. addition to Irwin & Leighton, 126 North 12th St., Philadelphia, $75,000.

★**Pa., Johnstown**—T. J. Harris, supt. sts. and pub. wks., let contract rein.-con. bridge over Little Conemaugh River on Walnut St. to Hackedorn Contr. Co., 1134 Indianapolis Pythian Bldg., $49,767. Noted June 28.

★**Pa., Phila.**—Pennsylvania R.R. let contract 1-story, rein.-con. addition to Girard Point Works, concrete work and piling Pier No. 1, Girard Point to Brann & Stuart, Commercial Trust Bldg., $50,000 and $30,000 respectively.

★**Miss., Yazoo City** — See "Structural Steel."

★**O., New Phila.**—Co. Comrs. let contract rein.-con. beam bridge over Beaverdam Creek, Beaver Ave., to F. McClain, $5000; rein.-con. arch bridge over Little Stillwater Creek, East Center St. to A. Wardell, $18,600. Noted May 24.

★**Mich., Detroit**—Detroit Pressed Steel Co. let contract 4-story rein.-con. factory, 1800 Mt. Elliott Ave. to A. A. Albrecht Co., 1130 Penobscot Blvd.

★**Mich., Monroe** — (Official) — Co. Rd. Comrs. let contract concrete girder bridge over Swan Creek, Berling Twp., to Nolan & Gans, Edenville, about $10,000. Noted June 7.

★**S. D., Sioux Falls**—(Official)—County let contract rein.-con. outlet spillway for D. D. No. 1 and 2 to Sioux Falls Constr. Co., Sioux Falls. About $65,000.

★**Wash., Spokane**—Great Northern Ry. let contract concrete piers for several bridges to W. T. Butler Contr. Co., Central Bldg., Seattle. About $50,000.

★**Cal., Los Angeles**—L. Phillips let contract 3-story, 92 x 128-ft., rein.-con. store building to Kubach Co., Merchants Natl. Bank Bldg. About $107,500.

## STREETS AND ROADS

### Proposed Work

**N. J., Ocean City**—Bd. Freeholders plan new road from North Wildwood to Shore Rd. About $50,000. L. M. Rice, Wildwood, co. engr.

**N. J., Rahway**—City plans to pave Maple Terrace, asphalt. H. Lambert, clk.

**Pa., Phila.**—Council passed ordinance to pave portion Rising Sun, Etting, 7th, Lebanon, 59th, 57th, Jefferson, 64th and Warring Sts., grading and opening Grape, Rex, Litchfield, Frankford, Mifflin and Beaumont Sts. C. A. Albright, city engr.

**Md., Takoma Park**—Wash., D. C. Post Office—Council plans to pave Carroll Ave. About $30,000. S. W. Williams, mayor.

**Va., Hillsville**—County election Aug. 23 to vote on $300,000 bonds to build roads.

**Ga., West Point**—City plans to streets, business section, brick, concrete and asphalt block. About $60,000.

**Fla., Rockledge** — City voted $20,000 bonds to improve streets.

**Ala., Russellville**—City plans to improve streets. About $10,000.

**Miss., Ellisville**—County to sell $200,000 bonds to build roads.

**Miss., Marshfield**—Bd. Supervs. plan to issue $50,000 bonds to build sand clay roads, Dist. No. 1 and $4000 for sand clay roads, Dist. No. 2.

**Miss., Pontotoc**—Bd. of Co. Supervs. plan to issue bonds to build and improve highways, 5th Dist.

**La., Lake Charles**—City plans to pave portion Ford St.

**O., Ashland**—Council passed ordinance to pave, grade and curb Cleveland Ave. R. H. Conn, city engr.

**O., Canton**—State Highway Dept. received no bids paving 1.17 mi. Canton-New Franklin Rd. About $38,000. New bids.

**O., Cincinnati**—Council passed resolution to improve and pave Dryden, Mapleleaf and Arch Sts. F. Krug, city engr.

**O., Cincinnati**—Council passed ordinance to issue $20,400 bonds to improve and pave Rice, Cora, Collegevue, Larkspur and Hakill Sts. F. Krug, city engr.

**O., Cincinnati**—Co. Comrs. soon lets contract improving Hamilton Pike from North Bend Rd. to north corporation line of Mt. Healthy. About $175,000.

**O., Cincinnati**—County plans to pave portion Bogart Rd., concrete, cost, $30,300; Canal Rd., concrete, $50,500, macadam, $20,400.

**O., Cincinnati**—City plans to pave portion Arrow Ave., con. F. Krug, city engr.

**O., Cleveland**—Council approved plans paving Broadway Hill, dressed block stone, cost, $32,090; portion 105th St., $12,500; West 44th St., $7100; East 73rd St., $10,593. R. Hoffman, city engr. Noted June 28.

**O., Cleveland**—City and county plan to repave and widen portion Cedar Ave. and Broadway. About $206,000. County to appropriate $68,667 toward cost.

**O., Cleveland**—City plans to improve and pave portion East 103rd, Clayborne, East 104th, East 116th Sts. R. Hoffman, city engr.

**O., Columbus**—County to sell $15,000 bonds to improve Inter County Highway No. 49. J. Scott, clk.

**O., Dayton**—Co. making surveys for paving Dayton and Covington Pikes, from Montgomery county line to West Milton corporation line. A. Knoop, co. engr.

**O., Defiance**—Council having plans prepared estimating cost improving portion Summit, Hopkins and 5th Sts.

**O., East Liverpool**—City plans to pave, grade and curb, etc., portion Bradshaw Ave., hard burned vitr. brick. J. C. Kelly, city engr.

**O., East Liverpool**—County voted $38,000 bond issue to improve 6 mi. interstate highway from Beaver to Ohio state line.

**O., Ironton**—City council received plans and estimates for paving various streets. About $95,000. L. G. Howell, city engr.

**O., Lorain**—Council plans to pave various streets. About $87,600. C. M. Osborne, city engr.

**O., Marion**—City plans to issue $60,000 to build sidewalks and pave streets. H. H. Noyes, city engr.

**O., Newark**—Council passed ordinance to pave portion Evans St. C. B. Keller, pres.

**O., Portsmouth** — Council passed ordinance to improve portion 21st St. P. G. Harper, city engr.

**O., Youngstown**—City preparing plans for estimating cost, widening East Rayen Ave. F. M. Lillie, city engr.

**O., Youngstown**—Council passed ordinance to pave portion Queen St., Florida and Overland Aves. F. M. Lillie, city engr.

**Ind., Greenfield**—Co. comrs. plan to pave 3 mi. National Rd., brick. C. Boone, co. engr.

**Ind., Indianapolis**—County Comrs. issued $200,000 bonds to improve roads leading into post and to build new road to Ft. Benjamin Harrison.

**Ind., Indianapolis**—County sold $28,679 bonds to build 3 gravel roads.

**Ind., Lafayette**—City plans to sell $20,000 bonds to pave streets. Plans include improving portion Sheetz St. H. B. Overesch, city engr.

**Ind., Logansport**—Bd. Pub. Wks. plans to macadamize Seybold and Helm Sts. H. H. Thompson, city engr.

**Mich., Bay City**—Bd. Pub. Wks. soon lets contract paving Lincoln Ave. and Saginaw St. H. C. Thompson, city engr.

**Illinois** — State Legislature, Springfield, appropriated $3,800,000 to build roads during next 2 years.

**Ill., Belleville**—Bd. Supervs. voted $400,000 bonds to build hard surfaced roads.

**Ill., Chicago**—City plans to pave portion South Chicago Ave., creosoted block. About $143,000. J. Ericson, city engr.

**Ill., Chicago** — County Court approved plans to widen 1 mi. East 71st St., 66 to 110 ft. wide. About $80,000. J. Ericson, city engr.

**Ill., Lebanon**—Bd. Supervs. voted to issue $400,000 bonds to build roads. D. O. Thomas, co. supt.

**Ill., Moline**—City rejected bids repaving 5th Ave. Noted June 28.

**Ill., Springfield**—City plans to pave 66 blocks. W. D. Seeley, city engr.

**Wis., Ashland**—City plans to grade, repair and macadamize several streets. About $10,000. J. Phillips, city engr.

**Wis., Beloit**—City plans to pave portion Park Ave. G. E. Heebink, city engr.

**Wis., Madison**—A. R. Hirst, State Highway Comr. plans to build 300-mi. road and 350 bridges. About $4,200,000.

**Ia., Clinton**—J. G. Thorne, city engr., preparing plans paving portion Main St.

**Ia., Clinton**—City plans to pave 2nd Ave. involving 7300 sq.yd. bricking paving, 100 cu.yd. rock excavation, 6500 cu.yd. earth excavation, etc. About $20,000. J. G. Thorne, city engr.

**Ia., Des Moines**—Co. supervs. plan to build 5 mi. highway from Des Moines to Camp Dodge. About $132,000.

**Ia., Mason City**—Council plans to pave portion Division St. F. P. Wilson, city engr.

**Ia., Marshalltown**—City soon lets contract paving 27,000 sq.yd. Broad St. W. H. Steiner, city engr.

**Ia., Sioux City**—County plans to build 2 or 3 roads. About $70,000. Federal Government to appropriate toward cost.

**Ia., Sioux City**—Council plans to pave 25th and Aubin Sts. T. J. Johnson, city engr.

**Minn., Barnesville**—City plans to pave 7th Ave. S. E. Aamodt, clk.

**Kan., Kansas City**—City passed resolution to pave and curb Ann Ave., 26 ft. wide. W. M. Barclay, city engr.

Streets and Roads (Continued)

**Neb., Kearney**—Council passed ordinance to pave portion 23rd and 24th Sts., and 1st, 2nd and 5th Aves. E. H. Morey, city engr.

**N. D., Bowman** — Co. Comrs. voted to spend $10,000 on Yellowstone Highway and trunk line roads. F. Huff, aud. P. W. Thomas, engr.

**Mont., Butte**—City plans to pave portion Broadway; cost, $20,694, Granite St., $11,592. J. J. Armstrong, city engr.

**Mo., Benton** — County voted $800,000 bonds to build roads. Noted Apr. 19.

**Mo., Charleston**—City having plans prepared paving 48 blocks, asphaltic concrete, 32-, 36- and 44-ft. wide. Berthe Eng. Co., city engrs.

**Mo., Joplin**—Carthage, Webb City, Joplin, Mo., Galena, Baxter Springs, Kansas, Commerce, Miami and Oklahoma plan to build 60 mi. concrete highway from Carthage, Mo. to Miami, Okla. Address J. M. Malany, supt. Joplin Spl. Rd. Dist.

**Mo., Kingston**—County preparing plans building 132-mi. hard roads, 16 ft. wide, brick and concrete or concrete.

**Mo., Nevada**—City plans to pave portion Commercial and Austin Sts. S. L. Higgins, clk.

**Mo., New Madrid**—County plans election to vote on $28,000 bonds to build roads.

**Mo., St. Joseph**—Council passed ordinance to pave portion Missouri and Mitchell Aves. and Lowell St., also establishing grades portion Lowell St. C. P. Hoff, city engr.

**Mo., St. Joseph**—Bd. Pub. Wks. plans to pave portion 2nd St., also Duncan St., asphaltic concrete, Renick St., refined tar binder and oiling portion 2nd and Robidoux Sts. C. R. Hoff, city engr.

**Mo., Sikeston**—County election July 15 to vote on $800,000 bonds to build roads. Noted June 21.

**Ark., Arkadelphia**—C. C. Burkett and W. A. Garner, state highway engrs., making surveys building Arkadelphia-Hot Springs turnpike.

**Ark., Little Rock**—H. R. Carter, state highway engr. made surveys building 130-mi. Little Rock-Batesman Rd. from Little Rock through Argenta, Jacksonville, Cabot, Austin, Beebe, Searcy, Judsonia, Bald Knob, Newport and Batesville.

**Tex., Houston**—County voted $1,100,000 bonds to build and improve roads. C. H. Bryan, co. judge. Noted June 7.

**Tex., Huntsville**—County voted $12,000 and $25,000 bonds to build roads, Goshen Rd. and Bodlas Dists. W. J. Kelly, co. engr.

**Tex., Huntsville**—County preparing plans building 50-mi. road, 40 ft. wide, sand, clay, gravel, macadam and concrete, also building wooden bridges, concrete culverts. W. J. Kelly, engr. Noted May 31.

**Okla., Cement**—Cement Twp. votes July 14 on $25,000 bonds to build roads.

**Okla., Clinton**—Bd. Comrs. plan to pave 2 additional paving dists., with sheet asphalt. About $100,000. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

**Okla., Coalgate**—Co. comrs. rejected bids grading and surfacing 20-mi. road and bridges, Phillips Twp. New bids. Hess & Skinner & Peckham & Wilkins, Dallas, engrs. Noted May 24.

**Okla., Kingfisher** — City plans to pave Main and other streets.

**Okla., Marlow**—City soon receives bids paving streets, business section. About $60,000. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

**Okla., Nowata** — County voted $800,000 bonds to build roads.

**Okla., Sand Springs**—Council plans to pave streets, Dist. No. 2, asphaltic concrete; also install Sanitary Sewer Dist. No. 5. About $90,000. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

**Colo., Denver**—State Highway Comn. soon lets contract grading and paving 4-mi. between Denver and Littleton. J. E. Maloney, engr.

**Wash., Colfax**—Co. Comrs. passed resolution to create Improv. Dist. to build 23 mi. hard-surface roads between Steptoe and Ewan. About $160,000. J. M. McCaw, co. engr.

**Wash., Seattle**—Bd. Pub. Wks. approved plans grading 30th Ave. South, et al. About $20,000. C. B. Bagley, secy.

**Wash., Seattle**—A. H. Dimock, city engr., submitted report to Bd. Pub. Wks., estimating cost paving portion Michigan St., at $14,337; Valley St., $9385.

**Wash., South Bend**—County voted $250,000 bonds to build 45-mi. hard surfaced highways and 3 bridges. C. S. Henry, engr.

**Wash., Spokane**—Co. Comrs. soon receive bids paving 4 mi. permanent road, east from Fairfield to Palouse Highway. About $40,000.

**Wash., Vancouver**—State Highway Comn. approved plans Co. Comrs. for paving 4th Plain Rd. About $28,000.

**Ore., Pendleton**—City soon receives bids paving portion Webb St., gravel bitulithic. About $16,671.

**Ore., Roseburg**—County to sell $550,000 bonds July 28 to improve roads.

**Cal., Modesto**—City election July 30 to vote on $40,000 bonds to pave streets. Noted May 24.

**Cal., Redding**—County plans election to vote on $60,000 bonds to build roads, Inwood Rd. Div.

**Que., Hull**—City plans to pave streets and build concrete sidewalks. About $32,500. J. P. Laforest, city engr.

**Que., Quebec**—Provincial Highway Dept. plans to macadamize 20-mi. road from Chicoutimi to Jonquieres and Bagotville. J. A. Tessier, minister of roads.

**Ont., Galt**—Council plans to pave 1½ mi. streets.

**Man., St. Boniface**—Dept. Pub. Wks. soon lets contract paving Marion and Hill St., also building concrete sidewalks Berry St. J. B. Cote, clk.

### BIDS DESIRED

**Massachusetts**—(Official)—Until July 10 by State Highway Comn., Boston, building section highway, Uxbridge Twp. R. H. Newell, selectman, Uxbridge Twp.

**N. J., Cedar Grove**—Until July 12 by Bd. Freeholders, Newark, paving Little Falls Rd. About $57,600. F. A. Reimer, Newark, co. engr. Noted June 28.

**N. J., Elizabeth**—Until July 12 by Bd. Pub. Wks. paving 1694 sq.yd. Mellon Pl., shale brick, 6-in. concrete foundation, blue stone curb. T. E. Collins, city engr.

**N. J., Jersey City**—(Official)—Until July 10 by Bd. Comrs. improving portion St. Paul's Ave. C. S. Van Kewien, city engr.

**N. J., Hawthorne**—(Official)—Until July 18 by Bd. Freeholders, Paterson, for improving Goffle Rd. J. MacDonald, dir.

**W. Va., Huntington**—Until July 11 by city comrs. paving portion 6th St. A. B. Maupin, city engr.

**La., Amita**—(Official)—Until July 9 by Bd. Supervs. Rd. Dist. No. 4, grading, graveling, bridging 3.3 mi. Kentwood east and west Rd., grading and bridging 4.36 mi. Tangipahoa east and west Rd., also graveling 3.86 mi. same. G. A. Kennon, Kentwood, secy. J. M. Fourmy, Hammond, engr.

**Ky., Louisville**—Until July 9 by Bd. Pub. Wks. building portion Stephenson Ave., vitr. brick. D. R. Lyman, city engr.

**O., Cincinnati**—(Official)—Until July 13 by C. F. Hornberger, dir. pub. ser., for grading, setting granite curbs, paving roadway with brick and installing necessary drains, etc., portion Scioto St. Noted May 31.

**O., Newark**—(Official)—Until July 9 by Co. Comrs. building 1.91 mi. Rd. No. 3, Hartford Twp., water-bound macadam. J. W. Hursey, aud.

**O., Wauseon**—Until July 21 by J. C. King, village clk., paving Beach St.

**Ind., Indianapolis**—Until July 9 by Bd. Pub. Wks. paving portion Winthrop St. J. T. Jeup, city engr.

**Ind., Rochester**—Until July 14 by Co. Comrs. building gravel road on line Fulton and Marshall counties. E. A. Smith, aud.

**Wis., Madison**—Until July 9 by city paving portion King St. asphaltic concrete. H. V. Tanant, city engr.

**Minn., Carlton**—Until July 9 by A. R. Norman, co. aud., building 2½ mi. state roads.

**Minn., Chaska**—Until July 9 by Co. Comrs. building 2½-mi. state roads. J. B. Connolly, aud.

**Minn., Duluth**—Until July 9 by O. Halden, co. aud., clearing and improving 1½ mi. Burnett Rd., 1½ mi. La Vague Rd., 2½ mi. Britt Rd., 3 mi. Britt-Pike River Rd.

**Neb., Lincoln**—Until July 14 by County paving and grading Dist. No. 16, asphaltic concrete, vertical fibre brick and concrete About $15,000. A. E. Sutherland, clk.

**Wyo., Casper**—(Official)—Until July 9 by C. M. Bryan, city clk., paving and grading portion Wolcott, 1st, 3rd, and 4th Sts., bitulithic. Noted June 14.

**Tex., La Grange**—Until July 10 by R. Klatt, co. clk., building east approach to Colorado River bridge, 500 ft. length, 15-ft. roadway.

**Idaho**—Until July 25 by State Highway Comn., Boise, building 45-mi. highway from Washington county line to New Meadows. About $120,000.

**Wash., Everett** — Until July 16 by co. comrs., hardsurfacing Bond Issue Proposition No. 26 and 29; building Permanent Highway, No. 11-B, Auburn-Enumclaw Rd., concrete, cost, $100,000; building Juanita Kirkland Rd., Permanent Highway No. 2-F, concrete, $100,000. S. J. Humes, co. engr.

**Wash., Port Orchard**—Until July 16 by co. comrs. building and improving Permanent Highway No. 1-C. F. D. Gore, co. engr.

**Wash., Walla Walla**—Until July 13 by co. comrs. building Permanent Highway No. 16. G. Cookerly, co. engr.

**Cal., Yuba City**—Until July 9 by City paving portion 2nd and Bridge Sts.

### PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

**Massachusetts** — State Highway Comn., Boston, received low bids building section highway, Washington and Hindsdale Twps. from L. Suzio Constr. Co., State and Brooks Aves., Meriden, $109,889; Crowe & Walsh, Pittsfield, $116,202; Perini Constr. Co., Ashland, $130,361.

★**Mass., Boston**—City let contract road oil to A. Speare's Sons Co., 156 6th St., Cambridge, $23,850.

★**Mass., Brookline** — Town let contract paving 4600 sq.yd. grooved wood block pavement Harvard St. to Simpson Bros., 166 Devonshire St., Boston, $24,512.

★**N. Y., Binghamton**—City let contract paving Tompkins St., bitulithic, to Warren Bros., 142 Berkley St., Boston, $2.44 sq.yd.

★**N. Y., Little Valley**—Town let contract paving Main St., brick to J. Morrisey, Dunkirk, $13,532.

★**N. Y., Long Island City**—M. E. Connolly, boro. pres. let contract improving portion Van Alst Ave. to Hastings Pavement Co., 25 Broad St. About $10,000. Noted June 21.

★**N. J., Hackensack** — (Official) — Bd. Freeholders let contract paving 2nd Sect. Ft. Lee Turnpike to Ufheil Constr. Co., Peetzburg, $21,423. Noted June 21.

**Pennsylvania**—G. H. Biles, 2d Deputy State Highway Comrs., received low bids building 4836 ft. concrete road, Center Twp., from J. W. Hallam, Washington, $28,732; Reed, Yoders & Moore, Waynesburg, $32,301; R. Swan, Jr., Co., Jenkins Arcade, Pittsburgh, $48,816.

★**Pa., Eddystone**—Council let contract paving Essington Ave. to Union Paving Co., 30th and Locust Sts., Philadelphia. $52,000.

**Pa., Phila.**—City received low bids paving portion Delaware Ave. also all street intersections between Reed and Snyder Ave. from McNichol Paving Co., 1723 Cherry St., $149,176 and $44,005 respectively.

★**W. Va., Huntington**—County let contract paving Kanawha and James River Rd. to Harrison & Dean, $100,000.

★**Ga., Atlanta**—City let contract paving Lakewood Park Driveways to Hudson Constr. Co., Charleston, W. Va., $1.97 per sq.yd.; Gordon Rd. and Ashby St. to Pittman Constr. Co., $1.57½ per sq.yd. Noted May 31.

★**Ga., Griffin** — Mayor and Council let contract grading, curbing, draining and paving various streets, vitr. brick to Augusta Vitrified Shale Brick Co., $135,820. Noted June 14.

★**Miss., Greenville**—Co. Comn. let contract building Greenville-Leland Rd. to Healy Constr. Co., Meridian, $94,000.

★**Miss., Hattiesburg**—County let contract building 60-mi. Jefferson Davis and Natchez Mobile Highway to Central Alabama Constr. Co., Montgomery, Ala., $91,507.

★**Miss., Vicksburg**—City let contract paving Clay and East Aves., to Southern Paving Constr. Co., James Bldg., Chattanooga.

**Tenn., Cleveland**—City received low bids paving 51,000 sq.yds. and installing storm sewers various streets from Merrill Road Improv. Co., James Bldg., Chattanooga, $120,189. Noted May 31.

★**Tenn., Knoxville**—(Official) —Bd. Pub. Pub. Wks. let contract resurfacing 35,000 sq.yd. to Murry Constr. Co., Holston Natl. Bank Bldg., $1.13 sq.yd. Noted June 21.

★**Tenn., Lawrenceville**—County let contract building Pulaski, Waynesboro, Ethridge, Cross Rds. and Henryville Rd. to B. Williams, McMinnville, $99,037.

★**Ky., Louisville**—City let contract rebuilding Main St., concrete, to H. J. Meyers, Covington, $13,000.

★**O., Canton**—County let contract paving Canton-Middle Branch Rd. to Wise Bros., Canton, $38,400.

Streets and Roads (Continued)

★**O., Canton**—County let contract paving Meyer's Lake Rd. to H. Corl, Canton, $26,396; Canton-Middlebranch Rd. to Wise Bros., Canton, $38,452.

★**O., Cleveland**—(Official)—City let contract paving Bulkley Rd. to Cleveland Trinidad Paving Co., 420 Lakeside Ave., $19,-118. Noted June 14.

★**O., East Youngstown**—Village let contract improving Warhurst Rd. to W. H. Keesecker, East Youngstown.

★**O., Napoleon**—Co. comrs. let contract building Pope Rd. to J. Westrick, $53,000.

★**O., Newark** — Co. Comrs. let contract improving 1 mi. streets to Federal Paving Co., Hamilton, $52,000.

**O., Sprinfield**—City received low bids paving West High St. from M. J. Hannah and F. J. McHugh, East High St., each bidding $35,496.

★**O., Toledo**—County let contract building Berkey Rd. to Warner & Mackechnie, $35,063.

★**O., Toledo**—City let contract paving Academy Ave. and Swan Lane to Peters Bros.; alley between Erie and Ontario St. to McKinney Bros.

★**O., Warren**—County let contract building Youngstown-Conneaut Rd., Brookfield Twp., to Evans Bros. Constr. Co., Hubbard, $34,642.

★**O., Waverly**—County let contract building 1 mi. brick road on Columbus and Portsmouth Highway to Bolin & Wilt, Washington, C. H., $30,535.

★**O., Youngstown**—Bd. Control let contract paving Lucius Ave., asphaltic concrete to Kelley & Meyer, $2.00 per yd., Glenwood Ave., concrete to Lee Tiberio, installing sewers in several streets to Miller & Tobin.

★**Ind., Anderson**—Co. comrs. let contract building William P. Cox Rd. to W. J. Neidhardt & Co., $38,450; Harlas Thomas and Charles Wright Rds. to J. D. Reason & Co., $37,853 and $28,975 respectively.

★**Ind., Galesburg**—Co. Comrs. let contract building Main St. Rd., medora vitri. brick, to S. R. Adams & Co., Princeton, $48,400.

★**Ind., Goshen**—County let contract building 6500 ft. brick road to E. Crip, Goshen, $22,750.

★**Ind., Indianapolis**—Bd. Comrs. let contract building brick road from Millersville to Ft. Harrison to Northern Constr. Co., Elkhart, $137,500.

★**Ind., Newcastle**—City let contract paving various streets to J. Garvey, Newcastle, $24,120.

**Ind., South Bend**—Bd. Pub. Wks. received low bids paving Milton St. from Williston Constr. Co., Western Constr. Co., Phoenix Bldg., Iowa City; W. B. Brady Constr. Co., 623 J. M. S. Bldgs.

**Ill., Joliet**—City received low bid paving 3rd Ave. and Wilson St. from R. H. Conway Co.

★**Ill., Monmouth**—County let contract building 5,500 ft. state-aid concrete highway to E. A. Lord Constr. Co., $14,837.

★**Ill., Polo**—City let contract paving 9 blocks brick to Gund-Graham Co., Freeport, $43,141.

★**Ill., Rockford**—County let contract building 1-mi. brick road from Kishwaukee St. Rd. to military camp to A. E. Rutledge.

★**Ill., Rock Island**—City let contract paving portion 41st St. to McCarthy Improv. Co., 3rd and Perry Sts., Davenport, Ia., hillside brick, $2.08 yd., $2.12 brick with pitch filler, 40c. excavation, 60c. storm drains, 45c. curbing, $40, catch basins, $50, manholes.

★**Ill., Sterling**—County let contract state-aid monolithic highway to F. Giffrow, $16,243.

★**Wis., Kenosha** — County let contract grading, draining, culverts, and surfacing roads with concrete to G. R. Wade, Kenosha, $18,000; C. Peterson, Kenosha, $64,000; J. Darrow, Waukegan, $40,000; E. H. Merrick, Burlington, $21,000.

★**Iowa**—State Highway Comn., Des Moines, let contract grading West Hill Rd., from Cherokee to state hospital grounds to G. W. Conden, 1406 W. O. W. Bldg., Omaha.

★**Ia., Glenwood**—City let contract paving 35,693 sq.yds. streets, including grading, curbing, guttering, etc. to J. A. Beebe, 4201 Commercial Ave., Omaha.

**Neb., Lincoln**—County received low bids paving Dist. No. 373 from Abel Constr. Co., $43,389; Burke Cochrane Constr. Co., $43,-932.

★**S. D., Huron**—City let contract 5331 sq. yds. paving, 2334 ft. gutter, 1400 ft. curb and 995 cu.yds. grading to C. H. Atkinson Paving Co., Watertown, $12,892.

★**Mo., St. Joseph**—Bd. Pub. Wks. let contract grading portion Clay St. to J. F. Buis, 1722 Lafayette St.

★**Mo., Kansas City**—Park Bd. let contract paving Paseo from Swope Parkway to Swope Park to S. Smith, H. Vaughan, F. Larmer and J. E. Welch. Noted May 31.

★**Ark., Clarksville**—City let contract paving streets to Bell & Walker. Asphalt Co., Dallas, $33,000.

★**Okla., Durant**—City let contract paving various streets to E. C. Baum. $31,207.

★**Idaho**—State Highway Comn. let contract grading 33 mi. highway Washington Co. to S. C. Comerford, West of Joplin Cemetery, $90,000. Noted June 28.

★**Utah, Salt Lake City**—City let contract paving 9th S. 3rd E and Belmot Sts. to J. W. Mellen, Auditorium Bldg., $60,715; Canyon Rd. to P. J. Moran, Inc., 152 West 2nd St., $4089. Noted June 7.

★**Ariz., Phoenix**—City let contract paving North 4th St. to D. Jones.

★**Washington** — State Highway Comn., Olympia, let contract building Inland Empire Highway, Whitman Co. to G. L. Stickler, Pullman, $17,276.

★**Wash., Bellingham**—Co. Comrs. let contract paving Geneva Rd. to Riddle & Hawkins, Bellingham, $54,235. Noted June 21.

★**Wash., Everett**—Co. Comrs. let contract paving 2-mi. Arlington-North Fork Rd. to Kiser Paving Co., Everett, $29,380. Noted June 28.

★**Wash., Olympia**—State Highway Comn. let contract building Olympia Highway to Erickson Constr. Co., 25 Downs Bldg., Seattle, $46,130. Noted May 31.

**Wash., Seattle**—City received low bids laying concrete sidewalks, Greenwood Ave., et al., L. I. D. 3070, from J. Doyle, $22,264; E. J. McQuade, $22,386; Superior Constr. Co., 1642 Lane St., $23,078.

**Wash., Seattle**—City received low bids paving Stoneway, L. I. D. 2815, from McHugh Paving & Constr. Co., Beacon and Chicago St., $36,047; R. G. Stevenson, 1327 Erwing St., $36,227.

**Wash., Spokane**—Co. Comrs. received low bids paving White Rd. No. 23 from Spokane Bitu-Mass Co., Spokane, $55,920.

★**Ore., Coquille**—County let contract building roads to Grant, Smith & Co., Henry Bldg., Seattle, Wash. $135,000.

★**Ore., Fossil**—State Highway Comn., Salem, let contract building 3¾ mi. John Day Highway to Elliott Contr. Co., McKay Bldg., Portland, $10,550. Noted May 24.

★**Cal., Fresno**—City let contract improving Madison Ave. to Thompson Bros., Fresno.

★**Cal., Stockton**—City let contract improving various streets, College Park Dist. to C. Moreing & Sons, Commercial & Savings Bank Bldg., Stockton.

**Cal., Stockton**—City received low bids paving streets as follows: (a) Resolution No. 557, (b) Resolution No. 558 from Paul & Caldwell (a) $185,917; Clark & Henry Constr. Co., Oschuer Bldg., Sacramento, (a) $186,258 (b) $247,695; Johnson Shea Co., Riverside, (a) $194,496 (b) $260,345.

★**Cal., Visalia**—County let contract building 8.7 mi. Visalia-Exeter Div. to Tibbetts Pacific Co., San Francisco, $90,478; Visalia-Tulare Div. to J. H. Shafer, $99,892; Earlimart to Pixley Div. to J. F. Benson & Son, San Francisco, $67,692; road from Earlimart to county line stretch to Mesiner & Rice Co., Marsh Strong Bldg., Los Angeles, $72,238.

★**Que., Quebec** — Provincial Highway Dept. let contract macadamizing highway to A. Carriere, St. Tite de Champlain, $109,000.

## RAILWAYS—STEAM & ELECTRIC

### Proposed Work

**Delaware**—Delaware & Maryland Traction Securities Co., recently incorporated at Dover with $5,000,000 capital, will build electric railway in Delaware and Maryland. D. Lindes, Franklin Bldg., Phila., interested.

**West Virginia**—Morgantown & Wheeling Ry. plans to construct 8 mi. new track. R. D. Hemen, Morgantown, ch. engr.

**Florida**—Florida East Coast Ry. considering construction of line from Okeechonee to West Palm Peach, about 60 mi. E. B. Carter, St. Augustine, ch. engr.

**Ohio**—Cleveland, Cincinnati, Chicago & St. Louis Ry. plans to double-track line from Springfield through Bellefontaine to Urbana. C. A. Paquette, Cincinnati, ch. engr.

**Kansas**—Wichita-Walnut Valley Interban Ry. secured right-of-way for line Wichita to Augusta. C. Payne, Wi secy.

**Texas**—San Antonio Traction Co San Antonio Gas and Electric Co. wi merged into new corporation to be k as San Antonio Electric Co. with $4,7 capital stock. The new company pla construct an interurban electric line San Antonio to Austin, about 82 mi. line to run from San Antonio to Gov ment Aviation Sta. W. B. Tuttle, East Houston St., vice pres.

**Texas**—Southern Pacific Co. appropri $200,000 for preliminary expenditures double-tracking line from El Paso to son, Ariz., about 300 mi. W. Hood, Bldg., San Francisco, ch. engr.

**Arizona**—Pacific Gas & Electric Co. Phoenix granted authority by State Comn. to issue $555,000 bonds, proceeds be used in making extensions to street railway system, enlarging electric power plant and making other improvements. R. S Masson, Los Angeles, gen. mgr.

**Washington**—Chicago, Milwaukee & St. Paul Ry. plans to spend about $125,000 for extending lines to cantonment camp at American Lake near Tacoma. C. F. Loweth, Chicago, ch. engr.

### PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mississippi** — Alabama & Mississippi R.R. let contract extending line from Leakesville to connect with line of Wausau Southern Lumber Co. at Laurel, about 35 mi. to Powell & Co., Hattiesburg.

★**Tennessee** — Nashville, Chattanooga & St. Louis Ry. let contract branch line about 6 mi. long near Dunlap for Chattanooga Coal & Iron Corp. to Lacey Constr. Co., Anniston, Ala. Cost, $150,000.

**California**—Bd. Pub. Wks., San Francisco, received lowest bid Municipal Ry unit through Twin Peeks tunnel from Eaton & Smith, 407 11th St., San Francisco. About $81,000.

## EXCAVATION AND DREDGING

### Proposed Work

**Ill., Beardstown** — Drainage — Comrs. Coal Creek Drainage and Levee Dist. rejected bids opened June 18 for drainage ditches requiring 76,359 cu.yd. excavation. Noted June 28.

**Ia., Clinton**—See "Streets and Roads."

**Minn., St. Cloud** — Ditch — County will build Ditch No. 40. About $39,935. N. Thomey, co. aud.

**Utah, Salt Lake City**—Drainage—Jordan River D. D. will issue $80,000 bonds to reclaim 43,000 acres in Jordan River Basin. Address G. R. Bothwell, 3rd St., E. Noted May 3.

**Wash., Centralia**—Irrigation—O. L. Waller, vice pres. Washington State College, revived project to irrigate Fords and Waunchs prairies by ditch system leading from Skookumchuck River. An engineer will be employed to make a survey and prepare an estimate of cost of work.

**Cal., Los Banos** — Irrigation — Panoche Canal Co. plans to construct 5 mi. main canal and 3 pumping plants to irrigate 77,000 acres. About $500,000.

### BIDS DESIRED

**Tenn., Huntingdon** — (Reclamation) — Until July 14, by Carroll Co. D. D. No. 1 for ditches and canals to reclaim 12,500 acres land, requiring about 1,226,000 cu.yd. excava. W. Enochs, co. judge, chn. bd. dir. A. A. Oldfield, Huntingdon, drainage engr.

**Ind., Fowler**—Ditch—Until July 10, by G. W. Bates, supt. constr., for James Hollingsworth, et al., public ditch; 52, 600-ft. open drain on main line and 5, 100-ft. tile.

**Ill., Kankakee**—Drainage—Until July 21, by A. Falter, sole comr., Joe Benes D.D., Court House, for constructing entire district involving Bracken, A, B, C, D, Smith, Gladu and Healy Branches. L. C. Looker, engr. dist.

**Ia., Indianola**—Drainage—Until July 10 by Squaw Creek D.D. No. 4 for new channel. T. Darnell, aud. A. S. Van Sandt, Clarinda, engr.

**Ia., Jefferson**—Drainage—Until July 10, by Bd. Superv. Greene and Webster Cos., Jefferson, for furnishing 1400 ft. 44-in., 3700 ft. 32-in., 2900 ft. 30-in., 6200 ft. 28-in., 400 ft. 22-in., 2100 ft. 20-in., 2700 ft. 18-in., 100 ft. 16-in., 6300 ft. 14-in., 12,630 12-in., 7330 ft. 10-in., 6130 ft. 8-in., 2885 ft. 7-in., 8545 ft. 6-in., and 220 ft. 5-in. tile; also 220 ft. asorted sewer pipe, 12- to 6-in for Joint D.D. No. 110, Green Co., and No. 221, Webster Co. S. J. Nelson, Jefferson, engr.

Excavation and Dredging (Continued)

**Ia., Spencer**—Ditch—Until July 10, by A. W. Chamberlain, co. aud., for constructing main open ditch and 2 concrete bulkheads on D.D.-No. 37.

**Minn., Cambridge**—Ditches—Until July 14, by G. C. Smith, co. aud., for County Ditch No. 16, cost, $14,846; No. 17, $11,609; No. 14, $8243. Noted June 28.

**Minn., Detroit**—(Official)—Ditch—Until July 27, by J. A. Narmun, co. aud., for building extension of branch No. 7 on Co. Ditch No. 15, about 88, 383 cu.yd. excava.; Co. Ditch No. 9, 105, 138 cu.yd. excava. and 2 50-ft. span steel beam pile bridges of creeks.

**Minn., Mankato**—Ditch—Until July 14, by C. L. Kennedy, co. aud., for Ditch No. 52, about $19,671.

**Minn., Redwood Falls**—Ditch—Until July 10, by L. P. Larson, co. aud., for County Ditch No. 121. About $10,444.

**Minn., Slayton**—(Official)—Until July 24, by E. V. O'Brien, co. aud., for repairing Co. Ditch No. 6, about $15,316, and Judicial Ditch No. 19, $35,401.

**Minn., Wadena**—Ditch—Until July 7, by E. Boss, co. aud., for County Ditch No. 11, requiring 21,283 cu.yd. excavation to cost 12c. per cu.yd. and 16,112 cu.yd. at 15c.

**Utah, Lake Shore**—(Spanish Fork Post Office)—Official—Drainage—Until July 16, by Superv. Lake Shore & Benjamin D. D., Meeting House, for open drains and covers, tile drains and levee work. J. S. Huff, secy. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

**PRICES AND CONTRACTS AWARDED**

(★Indicates award of contract)

★**La., Opelousas** — (Official)—Drainage—Bayou Mallet and Plaquemine D. D. let contract system involving 42.2 mi. ditch excavation to H. S. Clark, Abbeville, $53,500. Noted May 3.

★**Minn., Chaska**—Ditch—County let contract Ditch No. 22 to Central Constr. Co., 1450 West Lake St., Minneapolis. About $14,481.

★**Minn., Redwood Falls**—(Official)—Co. let contract Ditch No. 38 to G. McAllister, Glencoe, 10.85c. per yd. Noted June 21.

★**Minn., Waconia** — Ditch — County let contract Ditch No. 3 requiring 14,200 ft. 8 to 18-in. tile to N. J. Jensen, Hutchinson.

★**S. D., Sioux Falls**—Drainage—See "Reinforced Concrete."

★**Mo., Puxico**—Drainage—Superv. Mingo D. D. let contract system involving 5,000,000 cu.yd. excavation, 53 mi. lateral ditches, etc., to reclaim 32,000 acres to Bartson & Millard, Mayer Bldg., Peoria, and Traut & Osner, Beardstown. About $600,000.

**Ont., Hullett** — (Official) — Drainage—J. F. Fingland, clk., Londesboro, let contract Kinburn Swamp Brain and river improvement to A. Guhrm Seaforth, about $23,765. Noted June 14.

## INDUSTRIAL WORKS

**Proposed Work**

**Mass., Boston**—J. J. Johnston, 261 Brookline Ave., Brookline, plans 1-story, 80 x 300-ft. brick garage, Brainerd Rd. and Griggs St. About $160,000. H. F. Bryant, 334 Washington St., archt.

**Mass., Boston** — See "Reinforced Concrete."

**N. J., Bayonne**—Babcock & Wilcox Co. plans new brick machine shop, 1st St. and Hobart Ave. About $150,000.

**N. J., Harrison**—The General Electric Co. had plans prepared by R. H. Canfield, archt., 22 West 4th St., Corning, for 2-story, 135 x 255-ft. glass bulb factory. E. R. Scales, engr., Edison Lamp Wks., Harrison, soon receives bids. About $250,000.

**N. J., Jersey City**—Armour & Co., Union Stock Yards, Chicago, plans new packing plant, Monmouth and 17th Sts. About $1,000,000.

**N. J., Kingsland**—(Rutherford Post Office)—(Official) — Bridgeman Smith Co., Kent and Division Aves., Brooklyn, does not plan to build factory as stated in our issue of June 21.

**N. J., Linden**—Linden Tanning Co., 40 Spruce St., New York City, plans plant on 4-acre site recently purchased here. About $250,000.

**N. J., Newark**—W. Ball Co. plans 3-story, 90 x 188-ft. factory, St. Francis and Kossuth Sts. About $50,000. J. Greene, 27 Clinton St., archt.

**Pa., Palmerton**—(Official)—New Jersey Zinc Co., 55 Wall St., New York City, plans 3-story, 60 x 130-ft. laboratory. Cost $200,000. Donn & Deming, archts., 808 17th St., N.W., Wash., D. C., receiving bids about July 30th. Noted June 21.

**Pa., Phila.**—Fairmount Storage Co., plans 5-story storage factory, 23rd and Brown Sts.

**Pa., Pittsburgh**—Pittsburgh Electric Mfg. Co., 614 Station St., plans 210 x 220-ft. brick and concrete warehouse, Penn and Lexington Sts. About $50,000.

**Md., Baltimore** — Baltimore Buggy Top Co., 107 West Mt. Royal Ave., plans 3-story, 75 x 152-ft. factory.

**N. C., Wilmington**—International Navigation Co., 204 Franklin St., New York, plans new shipbuilding plant, cost, $5,000,000; also steel rolling mills, ship berths, machine shops, etc. W. H. Garland, pres.

**N. C., Wilmington**—Metal Stamping Co., recently organized with $200,000 capital stock, plans to build 2 factories.

**Ga., Brunswick**—United States Maritime Constr. Co. plans shipbuilding plant here. About $2,000,000.

**Fla., Pensacola**—P. H. Brock of Pensacola Feed Co., and others, plan to build meat packing and storage plant here. About $50,000.

**Ala., Fairfield**—Finance Com. of U. S. Steel Corp., appropriated $11,000,000 to Tennessee Coal, Iron & R.R. Co., a subsidiary, for immediate development here.

**La., New Orleans**—Dixie Steel Co., recently incorporated with $500,000 capital stock, plans rolling mill. B. W. Seidell of Seidell-Grosz Mfg. Co., 1052 Magazine St., pres.

**Tenn., Chattanooga**—De Camp Glass Casket Mfg. Co., Memphis, plans to build plant. About $225,000. J. B. Witherington, pres.

**Tenn., Chattanooga** — Tennessee Paper Mill, recently incorporated with $200,000 capital stock, plans to build mill. J. Stagmaier interested.

**O., Cleveland**—Baltimore & Ohio R.R. submitted plans to City Council for freight terminal here. About $2,500,000. H. Lane, Baltimore and Charles Sts., Baltimore, ch. engr.

**O., Cleveland**—Kilby Mfg. Co., 4623 Lakeside Ave., N. E., plans 70 x 135-ft. addition, 49th St. and Lakeside Ave. About $50,000. W. S. Ferguson, 1900 Euclid Bldg., archt.

**O., Cleveland**—W. M. Lanesman, 1310 Schofield Bldg., plans garage and service plant, Cedar Ave. and Stearns Rd. About $75,000 to $100,000.

**O., Cleveland**—Standard Steel Co., 3311 West 73rd St., having plans prepared for an addition to provide 15,000 additional square feet floor space; also another steel foundry to be erected in 5 units.

**O., Toledo**—Toledo Furnace Co. soon lets contract for 6 brick, steel and concrete factories. About $100,000. F. C. Warner, 767 Hipp. Annex Bldg., Cleveland, engr.

**O., Youngstown**—Liberty Steel Co., increased capital stock from $600,000 to $750,000 and plans to build additions.

**Mich., Detroit**—Great Lakes Engr. Co., East Atwater St., plans addition to plant. About $75,000. Smith, Hinchman & Grylls, Washington Arcade, engrs.

**Mich., Grand Rapids**—Furniture Mfg. Assn., 216 Lyon St. N. W., plans warehouse on Fulton St., N. About $100,000.

**Ill., Chicago**—Gibson Motor Car Co., 923-30 East 47th St., had plans prepared by H. L. Newhouse, archt., 4630 Prairie Ave., for 1-story, brick garage. About $50,000.

**Ill., Chicago** — Kellogg Switchboard & Supply Co. plans plant on West Adams St. About $200,000.

**Ill., Chicago**—(East Chicago)—Mark Mfg. Co., Dempster and Dodge Sts., Evanston, plans new plant at East Chicago. About $14,500,000.

**Ill., Chicago**—H. G. Seal Co., 4410 Ravenswood Ave., plans 2-story, 120 x 125-ft. factory on Ravenswood Ave. About $100,000. W. T. Branitzky, 54 West Randolph St., archt.

**Ill., Rock Island**—See "Reinforced Concrete."

**Wis., Kenosha**—See "Reinforced Concrete."

**Kan., Wichita** — Cumberland Pipe Line Co., subsidiary of Standard Oil Co., plans 5000-bbl. oil refinery, North Lawrence Ave.

**S. D., Sioux Falls**—International Harvester Co., 606 South Michigan Ave., Chicago, plans to rebuild factory recently destroyed by fire. About $70,000. A. E. Bowring, local mgr.

**Mo., Joplin** — City defeated $225,000 bonds to build light plant. H. Phillips, clk. Noted May 31.

**Mo., Kansas City**—Sinclair Refining Co. plans storage tanks and buildings at 811-13 Harrison St. About $100,000.

**Tex., Houston**—Rio Grande Ice Assn., Harlingen and San Benito, plans ice plant here. About $150,000.

**Tex., Orange**—National Shipbuilding Co., recently incorporated, plans to build shipbuilding plant here. About $100,000. J. M. Dullahan, stockholder.

**Ore., Portland**—Hesse-Martin Iron Wks., 434 Belmont St., is having plans prepared for additions to its plant, including foundry, forge shop, etc. About $100,000.

**Cal., Los Angeles**—C. A. Watson, Alexandria Hotel, plans to build dye works. About $250,000.

**Cal., Martinez**—Kullman & Salz Tanning Co., had plans prepared for 5-story, 85 x 115-ft. addition to plant.

**Cal., San Diego**—J. B. Mitchell and L. Figheira of Los Angeles, plan to construct shipbuilding plant on tidelands between 28th and 30th St. About $1,500,000.

**Cal., San Francisco** — See "Reinforced Concrete."

**Ont., London** — Beatty Bros., York St., plan factory and boiler house. About $50,000.

**Ont., London** — Interurban Motors, Ltd., plans garage. About $50,000. G. W. Barburton, 183 Horton St., mgr.

**Ont., Springfield** — Springfield Milk Co. having plans prepared for addition. About $50,000. A. Ball, mgr.

**BIDS DESIRED**

**N. C., Wilmington**—See "Reinforced Concrete."

**Fla., St. Petersburg**—Until Aug. 1st by Universal By-Products Co. for new plant. About $250,000 to $300,000. J. F. Lavarne, 314 Ferguson Bldg., Pittsburgh, pres. R. Irvin, Union Bank Bldg., archt.

**PRICES AND CONTRACTS AWARDED**

(★Indicates award of contract)

★**Vt., Springfield**—Jones & Lamson Machine Co. let contract brick and rein.-con. addition to L. E. Hall, $100,000.

★**Mass., Holyoke**—Valley Paper Co. let contract power house, Water St. to P. J. Kennedy & Co., Inc., $50,000.

★**Conn., New Britain**—Stanley Wks., Hill and Lake Sts., let contract factory on Myrtle St. to Aberthaw Constr. Co., 27 School St., Boston. About $130,000.

★**Conn., Waterbury** — (Official)—Scovill Mfg. Co., 99 Mill St. let contract 4-story, 63 x 216-ft. pattern building, East Main St. to Turner Constr. Co., 244 Madison Ave., New York City.

**N. J., Camden** — See "Reinforced Concrete."

★**N. J., Gloucester City** — New Jersey Shipbuilding Co., let contract 4 factories to G. F. Pawling & Co., 1400 Vine St., Phila., $1,000,000.

★**Pa., Phila.** — See "Reinforced Concrete."

★**Pa., Phila.**—American Stores Co. let contract 3-story, 80 x 120-ft. warehouse, 969-75 North 2nd St. to H. Gill, Jr., 2513 Germantown Ave., $75,000.

★**Pa., Phila.**—George B. Newton Coal Co., 1527 Chestnut St., let contract 341 x 375-ft. coal storage plant, 13th and Locust Sts., to Armstrong & Co., New Land Title Bldg. About $100,000.

★**Pa., Phila.** — Phila. Electric Co., 26th and Christian Sts., let contract 1-story, 54 x 64-ft. addition to its plant to J. R. Wiggins Co., 1215 Filbert St. About $60,000.

★**Pa., Phila.**—Twentieth Century Storage Warehouse Co. let contract, 7-story, 49 x 220-ft. warehouse, 3120-30 Market St. to George & Borst, 277 South 11th St. About $150,000.

★**O., Cleveland**—Euclid-Doan Co., East 105th and Euclid St., let contract, 146 x 150-ft. markethouse to Crowell-Lundoff-Little Constr. Co., 1957 East 51st St. About $112,000.

★**O., Cleveland**—Tabor Ice Cream Co., Wayne Ave., let contract 2-story garage and stable to De Hamel Constr. Co., American Trust Bldg. About $70,000.

★**O., Cleveland**—Warner & Swasey Co., 580 Carnegie Ave., let contract machine shop to Crowell, Lundroff, Little Constr. Co., 1901 East 57th St. About $60,000.

★**Mich., Detroit**—See "Reinforced Concrete."

★**Wis., Madison** — Pennsylvania Power Co. let contract 1-story hydro-electric plant to J. R. McDonald, Black River Falls, $500,000.

★**Mont., Bowdoin**—Great Northern R.R., 11th St. and Hennepin Ave., Minneapolis, let contract engine terminal to Grant, Smith & Co., 1505 News Bldg., St. Paul, $300,000.

★**Ont., Toronto**—Polson Iron Wks. let contract boiler house to McGregor & McIntyre, 1139 Shaw St. About $60,000.

## BUILDINGS

### Proposed Work

**Conn., Hartford**—School—City plans addition to grade school. About $125,000. I. Allen, Jr., 904 Main St., archt.

**N. J., Jersey City**—Hospital—City plans to improve and enlarge. About $700,000. M. M. Fagan, mayor. J. T. Rowland, 98 Sip Ave., archt.

**Pa., Ardmore** — School — Lower Merion School Bd., will soon let contract, 1-story, 180 x 190-ft., brick, at Ashland Heights. About $70,000. E. H. Yardley, 1713 Sansom St., Phila., archt.

**Pa., Coatesville**—Club House—Loyal Order of Moose plans, 4-story, 45 x 140-ft. brick and stone. Kerns & Carroll, 67 South 6th St., archts.

**Pa., Tamaqua**—Temple—Tamaqua Lodge, F. and A. M., having plans prepared by B. Stevens, archt., 4-story, 40 x 150-ft., stone and terra cotta.

**Pa., Tarentum** — Hospital—Hospital Aid Assn. of Tarentum, retained P. C. Dowler, archt., Arrot Bldg., to prepare plans 2-story. About $100,000.

**Del., Wilmington** — Bank — (Official) — Security Trust Co., 6th and Market Sts., had plans prepared, 2-story, 50 x 52-ft. brick and marble addition. E. C. May, Du Pont Bldg., archt., will receive bids in about 2 months. Noted June 21.

**Del., Wilmington**—Club—B. P. O. E. plans, 6-story, 40 x 1000-ft. brick and stone. J. D. Thompson, Jr., Ford Bldg., archt.

**Wash., D. C.**—Office and Business—A. C. Mather, Commercial Bldg., Chicago, has had plans prepared by C. L. Harding, archt., 729 15th St., N. W. About $150,000.

**W. Va., Adamston** — High School — Bd. Educ. plans. About $85,000. E. C. Holmboe, Empire Bldg., Clarksburg, archt.

**Tenn., Memphis** — High School — Bd. Educ. having plans prepared by McGee & Lester, archts., Tenn. Trust Bldg., for Bartlett High School.

**O., Cleveland**—School—School Bd. having plans prepared by F. C. Warner, archt., 767 Hippodrome Annex. About $200,000.

**O., Cleveland**—High School—St. Johns Church, 1008 Superior Ave., plans, 3-story, brick and concrete, Euclid Ave. and East 107th St. About $200,000. E. T. P. Graham, 20 Beacon St., Boston, archt.

**O., Columbus**—Y. M. C. A. will build 5- or 8-story building. O. C. Darst, archt., 1109 Brunson Bldg., receiving bids about July 15. Cost $500,000.

**O., Greenville**—Hospital—Greenville Hospital Co. plans, 2-story. About $62,000. E. J. Mountstephen, 803 U. B. Bldg., archt.

**O., Plymouth** — (Official) — High and Grade School—Town will vote July 10 on proposition to construct high and grade school. Althause & Jones, Market Bldg., Mansfield, archts. Noted June 21.

**Ind., Indianapolis**—School—Indian University had plans prepared by R. F. Daggett, archt., Lemke Annex, for new medical school building.

**Ind., West Terre Haute**—High and Grade School—T. Concannon, trustee, 217 West 6th St., had plans prepared by D. B. Shourds, archt., 511 Tribune Bldg., Terre Haute, 2-story. About $55,000.

**Mich., Benton Harbor**—Church—Methodist Congregation plans. About $50,000.

**Mich., Chesaning** — High and Grade School—Bd. Educ. soon receives bids 2-story, 162 x 184-ft. About $65,000. J. D. Chubb, 108 North Dearborn St., Chicago, archt.

**Mich., Detroit**—Store—E. J. Hickey Co. purchased site at Woodward and Grand River Aves., and had plans prepared by Smith, Hinchman & Crylls, archts., and engrs., Washington Arcade, for 10-story store building.

**Mich., Lansing**—Armory—Armory Comn., c/o Col. Versey, State Military Bd., had plans prepared by S. D. Butterworth, archt., Tussing Bldg., 1- and 2-story, 125 x240-ft. About $90,000.

**Mich., Muskegon** — Armory — Muskegon Armory Comn., c/o F. C. Whitney, retained W. M. Clark, archt., Metz Bldg., Grand Rapids, 1- and 2-story, 90 x 200-ft. About $50,000.

**Mich., Muskegon** — Armory — Chamber Commerce and State plan. About $50,000.

**Ill., East Moline**—Y. M. C. A. had plans prepared by Whitsitt & Schulzek, archts., Peoples Bank Bldg., Moline, 4-story, 82 x 101-ft. building. About $100,000. W. E. Mack, Ross Bldg., secy.

**Wis., Ashland**—High School—Bd. Educ. plans to rebuild school recently destroyed by fire. About $250,000.

**Wis., Madison**—Grade School—Bd. Educ. had plans prepared by F. L. Kronenberg, archt., 127 North Hancock St., Madison, 60 x 112-ft., brick and hollow tile. About $50,000.

**Wis., Manitowoc**—Club—Elks' Clubhouse Co. soon receives bids, 2-story, 60 x 90-ft. brick. About $70,000. E. F. Miller, Dempsey Bldg., archt.

**Wis., Niagara**—High School—Bd. Educ. receiving bids about July 7, 2-story, 56 x 138-ft., brick. Cost, $50,000. D. Hubert, Menominee, archt. Noted May 31.

**Wis., Wanwatosa**—Sunday School and Church—1st Congregational Church plans. About $50,000. Charlton & Kuenzli, archts., Camp Bldg., Milwaukee, soon receives bids.

**Ia., LeMars**—College—LeMars Commercial Club conducting campaign to raise $60,000 towards 2 buildings for Western Union College.

**Ia., Sioux City**—Church—Trinity Lutheran Church receiving bids about Aug. 15, 1-story, 60 x 100-ft., cost, $75,000. Beuttler & Arnold, 609 Security Bldg., archts.

**Ia., Sioux City**—Hotel—North American Hotel Co. plans. About $750,000. W. B. Nation, mgr.

**Minn., Chisholm**—Auditorium—City retained A. Puck, archt., 617 Torrey Bldg., Duluth, to prepare plans for large auditorium.

**Minn., Duluth**—High School—Bd. Educ. receiving bids about Sept. 1. Cost, $375,000. C. E. Nystrom, Palldio Bldg., archt.

**Minn., Minneapolis**—Store and Office—Abbey Holding Co., plans 90 x 115-ft. brick, 800-08 Mary Pl., about $54,000. V. C. De Brauwere, 824 Plymouth Bldg., archt.

**Minn., St. Paul**—Church—St. Mark's Congregation will construct. About $100,000.

**Kan., Abilene**—High School—Bd. Educ. receiving bids about Aug. 1, 2-story, 98 x 150-ft. About $90,000. W. H. Sayler, 606 Gumbel Bldg., Kansas City, Mo., archt. Noted Apr. 26.

**Neb., Randolph**—Church—Francis De Chantal Congregation had plans prepared by W. L. Steele, archt., 502 Northern Bank Bldg., Sioux City, Ia. About $60,000.

**S. D., Sioux Falls**—Coliseum—City had plans prepared by J. Schwartz, archt., Pettigrew Bl., 132 x 150 ft. About $100,000.

**S. D., Spearfish**—Gymnasium—Bd. Educ. having plans prepared by F. H. Ellerbe, archt., 692 Endicott Bldg., St. Paul; 2-story, 100 x 100. F. A. Cook, pres.

**Wyo., Casper**—City Hall—City voted $270,000 bonds to construct city hall and improve water and sewerage systems.

**Mont., Butte**—Surgical Building—Deaconess Hospital had plans prepared by F. Hamill, archt., Henessy Bldg. About $150,000.

**Mo., Kansas City**—Club—Kansas City Club plans, 13th St. and Baltimore Ave. About $750,000. Smith, Rea, & Leavitt, 601 Finance Bldg., archts.

**Mo., St. Louis** — Church — St. Mary's Episcola Congregation had plans prepared by Nolte & Nauman, archts, Fullerton Bldg., for group buildings at Hamilton and Ridge Aves. About $200,000. L. H. White, rector.

**Ore., Portland**—Medical School—University of Oregon having plans prepared by Lawrence & Holford, archts., and Whitehouse & Fourlhoux, assoc. archts. About $125,000.

**Cal., Norwalk**—Hospital—State having plans prepared by B. G. McDougal, state archt., Sheldon Bldg., Sacramento, brick and concrete. About $132,000.

**Cal., Palo Alto**—High School—See "Reinforced Concrete."

### BIDS DESIRED

**Conn., Hartford**—Dining Hall, etc.—Until July 13, by State Comptroller, Capitol, for infirmary, dining hall, etc., for Storrs Agricultural College. About $75,000.

**N. Y., Yonkers**—(Official)—Sshool—Until July 10, by Secy. Bd. Educ., for P. No. 23. About $200,000. C. H. Chamber, 18 South Bway., archt. Noted June 21.

**O., Akron** — (Official) — School — Until July 20, by J. F. Barnhart, clk., bd. educ. for annex to Jennings School, East Tallmadge Ave. and Dayton St. T. H. Kelley, Cottage Pl., superv. archt.

**O., Alliance**—Until July 9 by W. H. Morgan, clk. bd. hospital comrs., for alteration and additions to old city hospital. W. W. Matchett, archt.

**O., Martins Ferry**—(Official)—School—Until July 21, by Bd. Educ. for ... School. C. W. Bates, Natl. Bank Bldg., Wheeling, W. Va., archt.

**Ind., Anderson**—Lodge—Until July 10 by ... D. McLane, archt., 301 Robinson Bldg., 2-story, 70 x 100-ft. for B. P. O. E. About $100,000. Noted June 21.

**Ind., Ft. Wayne**—Until July 31 by A. Hamilton, trustee, Wayne Twp., for building new school and altering 2 others.

**Ind., Terre Haute**—School—Until July 11 by T. Concannon, trustee, Sugar Creek Twp.

**Ia., Bronson** — (Official) — School—Until July 10, by Bd. Educ. About $50,000. Buettler & Arnold, 609 Security Bldg., Sioux City, archts. Noted June 21.

**Ia., Cresco**—School—Until July 16 by B. F. Davis, secy. bd. educ. G. L. Lockhart, 391 Endicott Bldg., St. Paul, archt.

**Minn., St. Peter** — Court House — Until July 9 by W. H. Holtz, co. aud., for addition. G. Pass & Son, Manakota, archt.

**Kan., Great Bend**—Court House—Until July 19, by W. E. Beardsley, co. clk., 4-story, 95 x 114 ft. About $150,000. W. E. Hulse & Co., 1st Natl. Bank Bldg., Hutchinson, archts.

**Mont., Livingston**—High School—Until July 21, by Bd. Trustees Park Co. High School for addition. About $60,000. G. H. Carsley, Power Blk., Helena, archt. Noted June 21.

**Cal., Palo Alto**—Until July 13, by Union High School Dist., for high school to consist of 7 buildings. About $200,000. Allison & Allison, 1405 Hibernian Bldg., Los Angeles, archts. Noted June 14.

### PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

**Mass., Gardner**—School—Town received low bid school on Coleman St., from Allen Bros., Amherst. About $60,000. Noted May 17.

★**Mass., Norwood**—School—Bd. Educ. let contract, 3-story, 97 x 210-ft., Hoyle, Washington and Bond Sts., to C. S. Cunninham & Sons, 7 Water St., Boston. Noted May 31.

★**Pa., Phila.**—Library—City let contract 1-story brick and stone, on Old York Rd. to Wark-Yardley Co., 1737 Filbert St., $68,555.

★**O., Canton**—School—City let contract to R. H. Evans & Co., Columbus Saving Bank Bldg., for addition to Clarendon Ave. School. About $58,531.

★**Ia., College Springs**—School—Bd. Educ. let contract 3-story, 72 x 134-ft., brick, stone and concrete, to S. Hotchkiss, 18th St. and Penn Court, St. Joseph, Mo., $65,000. Noted May 24.

★**Minn., Minneapolis**—Exchange Northwestern Telephone Exchange Co., 816 21st Ave., N., let contract, 3-story, brick, steel and tile, Highland Park, to J. H. Brous Co. About $82,000.

★**S. D., Sioux Falls**—Bank—Sioux Falls Natl. Bank let contract 9-story, 44 x 106-ft. brick and terra cotta, to Pike & Cook, 416 South 6th St., Minneapolis.

★**N. D., Drake**—School—Bd. Educ., let contract, 3-story, to R. B. Marschke, Lucca, $68,855.

★**N. D., Fargo** — Office — North Dakota Realty Co. let contract 8-story, 75 x 118-ft., to T. Powers & Co., Fargo. About $100,000.

★**Mo., Mexico**—Academy—Missouri Military Academy let contract addition to Ray & Son Constr. Co., Louisiana, $50,000. Noted May 24.

★**Mo., St. Louis**—Hotel—Roe Estate let contract remodelling and improving building for hotel to H. Horowitz, 521 Boatmen's Bank Bldg. About $100,000.

★**Tex., Victoria**—High School—Victoria Independent School Dist. let contract, 3-story, brick, to S. M. Bailey, Victoria. About $54,487.

Buildings (Continued)

★Okla., **Tulsa**—Freight House—St. Louis & San Francisco Ry. let contract, 40 x 330-ft. to C. Cunliff, Title Guarantee & Trust Bldg., St. Louis, $100,000.

★Cal., **Los Angeles**—Store—See "Reinforced Concrete."

## FEDERAL GOVERNMENT WORK

### Proposed Work

Pa., **State College** — Post Office — J. A. Wetmore, superv. archt., treas. dept., rejected only bid received June 12. Noted June 21.

Wash., **D. C.**—Repair Shop—Bureau of Yards and Docks, Navy Dept., rejected only bid received June 25 for addition to Nautical Instrument Repair Shop at Naval Observatory. Noted June 14.

N. C., **Chapel Hill**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected only bid received June 15. Noted June 28.

### BIDS DESIRED

Mass., **Winchester**—Post Office—Until Aug. 3, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Conn., **New London**—Storehouse—Until July 9, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., at Naval Sta.

N. J., **Dover**—Buildings—Until July 16, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., addition to 8 magazine buildings.

S. C., **Columbia**—Post Office—Until July 31 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Neb., **Chadron**—Post Office—Until July 31 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Mo., **St. Louis**—Levee Work—Until July 16, by Mississippi River Comn., 1311 International Life Bldg., constructing about 80,000 cu.yd. earth work in Henderson Co. D. D. No. 1, Ill.

Okla., **Cherokee** — Power Plant — Until July 25, at office of Indian Affairs, Interior Dept., Wash., electric power plant, wire fixtures, etc., at Cherokee Orphan Training School.

Ariz., **Globe**—Post Office and Court House—Until Aug. 6 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Wash., **D. C.**—Portland Cement—Until July 10 by U. S. Engr. Office, Room 305, Southern Bldg., furnishing and delivering at foot of 35th St., 15,000 bbls., more or less.

### PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

**N. H., Portsmouth**—Office Building—Bureau of Yards and Docks, Navy Dept., Wash., received bids, June 25 from F. W. Cunningham, 430 Congress St., Portland, Me., $32,423; C. H. Mead, 15 Beacon St., Boston, $41,664; C. M. Leach, Boston, cost plus 10%.

**Mass., Ft. Andrews**—Reservoir—Constr. Quartermaster, Ft. Warren, received bids, June 23, as follows: R. L. Whipple Co., Worcester, cost plus 10%; Hallett-Grant Constr. Co., 138 Federal St., Boston, $16,987, alternate bid, actual cost plus $1400; Hampshire Constr. Co., 108 South St., Boston. $16,900.

**N. J., Vineland**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, June 27, (a) limestone, (b) sandstone, as follows: Werner-Huberty Co., 657 Vanderbilt Ave., Brooklyn, N. Y., (a) $55,497; W. H. Fissell & Co., 1328 Bway., New York City, (a) $62,700, (b) $65,700; Metzger & Fisher Co., Denckla Bldg., Phila., (a) $64,614, (b) $64,614. Noted June 7.

Pa., **Monessen**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received only bid, June 26, from W. H. Fissell & Co., 1328 Bway., New York City, limestone, $57,000, sandstone, $58,000. Noted May 31.

Pa., **Phila.**—Storehouse—Bureau of Yards and Docks, Navy Dept., Wash., received bids, June 25, advance base storehouse as follows: (a) Net price and time for work, complete, in accordance with drawings and specifications, and based on use of solid brick for exterior walls. This item does not include heating, trolley, trolley beams and fittings. (b) Amount and time to be added to price and time stated under item (a) if trolley, trolley beams, and fittings as specified in paragraphs 130 to 133, inclusive, be installed; E. Baton, 12th and Sansom Sts., Phila., (a) $86,000, 140 days; (b) $3100, 10 days; McCloskey & Bahles, Phila., (a) $83,748, 150 days; (b) $3415; Turner Concrete Steel Co., 1713 Sansom St., Phila., (a) $89,750, 120 days.

Md., **Annapolis**—Artesian Well—Bureau of Yards and Docks, Navy Dept., Wash., opened bids June 25, artesian well at Naval Academy, from Sydnor Pump & Well Co., Inc., 1301 East Main St., Richmond, $8 per ft., 60 days, alternate bid, cost plus 10%; bid not in accordance with specification. E. Christmann, Massillon, O., $13,668, 60 days. Noted June 14.

★Md., **Cambridge**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to T. H. Mitchell, 207 Lake St., Salisbury, $49,089. Noted May 17.

★Wash., **D. C.** — Buildings — Bureau of Yards and Docks, Navy Dept., let contracts mine storage buildings as follows: 6 at St. Juliens Creek, Va., to Boyle-Robertson Constr. Co., Evans Bldg., $266,928; 3 at Newport, R. I., M. F. Kelly, 5 East 42nd St., New York City, $154,420; 2 at Hingham, Mass., Howard Bros., 41 Dorchester Ave., Boston, $73,863; 2 at Long Island, N. Y., Guarantee Constr. Co., 140 Cedar St., New York City, $93,550; 1 at Guantanomo, Cuba, Stewart Eng. Corp., 61 Bway., New York City, $57,600. Noted May 31.

Wash., **D. C.**—Bridge—Dist. Comrs. received bids, June 16, 2 bridges on line of 7th St. from: E. G. Gunnel, 36 P St., 10%; W. H. Allen Constr. Co., 12%; L. N. Johnson, Arlington, Va., 18%; C. H. Tompkins, Wash., 18%, cost plus percentage. Noted June 14.

★Fla., **Pensacola**—Storehouse and Magazine Building—Bureau of Yards and Docks let contract to Wise Granite & Constr. Co., American Natl. Bank, Richmond, $19,800. Noted June 21.

★Fla., **Pensacola**—Testing Shed—Bureau of Yards and Docks, Navy Dept., Wash., let contract testing shed for seaplane motors at Navy Aeronautic Sta. to Turner Constr. Co., Pensacola, $23,600, time 90 days.

S. C., **Beaufort**—Post Office—J. A. Wetmore, superv. archt., treas. dept., received bids June 20, from Wise Granite & Constr. Co., American Natl. Bank, Richmond, $40,990, and W. H. Fissell & Co., 1328 Bway., New York City, $47,900. Noted May 17.

S. C., **Port Royal**—Buildings—Bureau of Yards and Docks, Navy Dept., Wash., received bids, June 25, 8 buildings for officers' quarters (work complete), from W. T. Hadlow, 831 Park St., Jacksonville, $46,735, time, 100 days; Newport Contr. & Engr. Co., Newport News, Va., $54,063; 100 days; Simons-Mayrant Co., Charleston, $56,197, 100 days; Riggs, Distler & Stringer, 23-25 Light St., Baltimore, $9981, 100 days (partial bid).

★Ill., **Aledo**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Northern Constr. Co., 421 Milwaukee St., Milwaukee, $42,675. Noted June 28.

★Ill., **Olney**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Michie Constr. Co., 300 Camp Bldg., Milwaukee, $44,970; time, 1 year. Noted June 14.

★Kan., **Cherryvale**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. Weitz Sons, 713 Mulberry St., Des Moines, $38,300. Noted June 28.

★Mo., **Butler**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. Weitz Sons, 713 Mulberry St., Des Moines, $42,400. Noted June 28.

★Ark., **Fordyce**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to W. O'Neil & Sons Co., Faribault, Minn., $31,979. Noted June 28.

★Wash., **Bremerton** — Dock — Bureau of Yards and Docks, Navy Dept., Wash., let contract shipbuilding dock at Puget Sound Navy Yard to Sound Constr. & Eng. Co., 72 Union St., Seattle, about $566,000. Noted June 7.

Cal., **San Francisco**—Pipe Line—Bureau of Yards and Docks, Navy Dept., Wash., received only bid, June 25, 6-in. flexible joint submerged pipe line at Naval Training Sta., (a) work complete, (b) work complete, pipe to be extra strong, galvanized, joints reinforced with malleable iron reinforcing steels, (c) deduct from (b) for substituting 5-in. pipe line, from Healey-Tibbitts Constr. Co., 9 Main St., San Francisco, (b) $49,249, time, 120 days; (c) $6650. Noted June 21.

★Cal., **San Pedro** — Buildings — Constr. Quartermaster, 12th and Pacific Aves., let contract officers' quarters, barracks and other buildings at Ft. MacArthur to J. F. Atkinson, 610 South Bway., Los Angeles, about $249,000. Noted Apr. 26.

## MISCELLANEOUS

### Proposed Work

**Port Terminal — Bayonne, N. J.** — City Comrs. will hold election July 24 to vote on $10,000,000 bonds for port terminal along New York Bay. Address Terminal Com Bergoff Bldg, Bway. and 22nd St. Noted May 31.

**Elevated Railway—East Orange, N. J.**—Delaware, Lackawanna & Western R.R. will elevate lines through city. G. J. Ray, Hoboken, ch. engr.

**Pier—Phila., Pa.**—See "Reinforced Concrete."

**Transmission Line—Mosinee, Wis.**—Wisconsin Valley Electric Co. plans, from Mosinee to Stevens Point. M. E. Ewing, Wausau, mgr.

**Transmission Lines—Grinnell, Ia.**—Iowa Light, Heat & Power Co. plans to extend lines from Grinnell to Newburg, about 7 mi. L. E. Caldwell, Iowa City, mgr.

**Transmission Line—Hamilton, Ia.**—Keokuk Electric Co. will reconstruct its transmission line from Hamilton to Warsaw, 5 mi. J. P. Ingle, Keokuk, mgr.

**Transmission Line — Lexington, Neb.** — Lexington Mill & Elevator Co., owners of local electric-light plant, applied to State Ry. Comn. for permission to build, from Lexington to Cozard, about 18½ mi. A. C. LeFlang, Lexington, mgr.

**Park Improvements—Beaumont, Tex.**—City will hold election Aug. 7 to vote on $100,000 bonds for park improvements. J. G. Sutton, clk.

### BIDS DESIRED

**Fire Towers—Trenton, N. J.**—(Official)—Until July 13th by New Jersey State Hospital, building fire tower, fire escapes, etc. F. H. Bent, state archt.; advertised in this issue.

**Subway—Red Bluff, Cal.**—See "Reinforced Concrete."

**Incinerator**—Outremont, Que.—Until July 18 by E. T. Thompson, city clk., building incinerator.

### PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

**Dam—Albany, N. Y.**—(Official)—W. W. Wotherspoon, supt. pub. wks., received bids, June 26, new movable dam to replace existing dam No. 14 at Herkimer, Barge Canal Contr. No. 146, from Lupfer & Remick, Ellicott Sq., Buffalo, $80,335; Chesley, Earl & Heimbach, Inc., 20 Breckenridge St., Buffalo, $90,043; Mohawk Dredge & Dock Co., Inc., Herkimer, $101,981. Noted May 31.

★**Boilers, etc.—Newark, N. Y.**—(Official)—A. W. Beaven, pres. bd. mgrs., New York State Custodial Asylum for Feeble-Minded Women, let contract 2 boilers to W. B. Armstrong Co., $14,378; heating work, etc., W. F. Devendorf & Co., $13,398. Noted June 14.

★**Piers—Wash., Spokane** — See "Reinforced-Concrete."

★**Boardwalk—Newport Beach, Cal.**—City let contract, on Surf Ave., to G. Helms, Newport Beach, about $14,091.

---

**George L. Dresser**, representing the Jennsion-Wright Co., Toledo, O., has moved his offices from DeGraaf Bldg., Albany, N. Y., to 2632 Whitehall Bldg., New York City.

**Rolph Mills & Co.**, Colman Bldg., Seattle, have been appointed general agents for the U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J., in Oregon and Washington.

**L. H. Boydston** has been appointed sales manager for the Smith Form-A Tractor Co., Chicago, Ill.

**The Blaw Steel Constr. Co.** and the **Knox Pressed & Welded Steel Co.** have been consolidated under the name of the Blaw-Knox Co., with executive offices at Hoboken, Pa., general offices in the Farmers Bank Bldg., Pittsburgh, Pa., branch offices at New York, Chicago, Boston and San Francisco and works at Hoboken and Wheatland, Pa.

---

### TRADE CATALOGS

**Concrete Construction Appliances.** Gemco Mfg. Co., Milwaukee, Wis. Descriptive catalog; pp. 24; 5¼ x 8½ in.; illustrated. Includes adjustable shores, scaffold hangers, form and trench braces, column clamps, etc.

**Concrete Mixers and Mixing.** Koehring Machine Co., Milwaukee, Wis. Catalog No. 21; pp. 123; 7½ x 10½ in.; illustrated. Besides descriptions of various concrete mixers and outfits (including hot mixers), this deals with the proper time of mixing, the automatic measuring of water, and the use of the Koehring batch meter to ensure the mixing of each batch for a specified time.

# SEARCHLIGHT SECTION

## Contracts To Be Let

### PROPOSALS

Bids received until July 13, 1917.

## Barge Canal Terminals

STATE OF NEW YORK, OFFICE OF SUPERINTENDENT OF PUBLIC WORKS

Albany, N. Y., June 15th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Friday, July 13th, 1917, at which place and hour they will be publicly opened and read, for the construction of Barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

TERMINAL CONTRACT NO. 103.

For furnishing, installing and testing portable package freight conveyors for terminals at Rochester, Utica and Schenectady.

Contract plans sheets 1 and 2.

Plans may be seen and detailed specifications, engineers' estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans of drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the City of Albany or New York, issued by a national or State bank, in good credit within the State and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the State will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

# Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a. m. for issue mailed the next day

### PROPOSALS

Bids received until July 12, 1917.

## Deep Well Pump and Motor

Cuba City, Wis.

Sealed proposals will be received at the office of the Village Clerk, Cuba City, Wisconsin, at eight (8) o'clock P. M. on the 12th day of July, 1917, for drilling a deep well and installing a new pump and motor, consisting of the following approximate quantities:

250 lin.ft.—12 in. well cased complete.
500 lin.ft.—10 in. hole.
Deep well pump and pump head in place.
Motor in place.

Payment to be made in cash. Certified check on Cuba City bank for $500. Plans and specifications and forms on file with the Village Clerk or Engineer.

WALTER BREWER,
Village Clerk.

J. G. Thorne & Company, Engineer,
317 Howes Block,
Clinton, Iowa.

UNITED STATES ENGINEER OFFICE, Room 710, Army Building, 39 Whitehall Street, New York, N. Y.—Sealed proposals for dredging in Wappinger Creek, N. Y., and in harbors at Tarrytown and Peekskill, N. Y., will be received here until 12 M., July 30, 1917, and then opened. Further information on application.

### PROPOSALS

Bids received until July 9, 1917.

OFFICE OF THE STATE COMMISSION OF HIGHWAYS

Albany, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at one o'clock p. m. on Monday, the 9th day of July, 1917, for the repair of highways in the following counties:

Albany (two contracts—resurfacing and reconstruction).
Broome (two contracts—resurfacing)
Cattaraugus (one contract—resurfacing).
Chautauqua (one contract—reconstruction).
Columbia (one contract—reconstruction).
Erie (one contract—resurfacing).
Essex (one contract—resurfacing).
Greene (one contract—surface treatment).
Herkimer (one contract—surface treatment).
Jefferson (one contract—resurfacing).
Livingston (two contracts—resurfacing).
Monroe (one contract—resurfacing).
Oneida (two contracts—resurfacing and surface treatment).
Ontario (one contract—resurfacing).
Orange (one contract—reconstruction).
Oswego (two contracts—surface treatment).
Otsego (one contract—reconstruction).
Saratoga (one contract—resurfacing).
Seneca (one contract—resurfacing).
Steuben (one contract—resurfacing).
Washington (one contract—surface treatment).

Also broken stone contract No. 74, Erie County, on Road 1038 for No. 1 Stone 450 tons.
No. 2 Stone 375 tons.
No. 3 Stone 3200 tons.

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the Division Engineers in whose division the roads are to be improved. The addresses of the Division Engineer and the counties in which they are in charge will be furnished on request.

The especial attention of bidders is called to "General Information for Bidders" on the itemized proposal, specifications and contract agreement.

EDWIN DUFFEY, Commissioner.
I. J. MORRIS, Secretary.

Bids received until July 10, 1917.

## Log Road Construction

Putnam, Va.

Bids will be received by the undersigned for the grading of 6 miles of standard gauge log road in Russell and Buchanan Counties, Virginia, according to Plans and Specifications, which can be seen at the office of the undersigned at Putnam, Va., or at the office of J. P. Williams, Jr., Chief Engineer, Tazewell, Va.

WHITE OAK LUMBER CO.

Bids close July 10th, 1917.